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THE ADAI-KHOKH GROUP, CENTRAL CAUCASUS.*

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It is now some forty-five years since the adventurous journey of Mr. Freshfield and his companions, Messrs. C. C. Tucker and A. W. Moore, first brought home to Western geographers a true idea of the extent and importance of the glacier regions of the Caucasus. During the course of that journey the great volcanic peaks of Elbruz (Mingi Tau), 18,470 feet, and Kazbek, 16,546 feet, both considerably higher than Mont Blanc, and both European mountains, if we consider the watershed as the continental boundary, were ascended for the first time. The party also effected the first crossing—from Europe to Asia—of the splendid glacier and *névé* of Karagom, which forms perhaps the most remarkable feature of the group dealt with in this paper. In 1868, and for many years thereafter, mountain explorers had to use as the basis of their work the 5-verst (1 : 210,000) map of the Russian Survey. This map, constructed for military and administrative purposes, naturally enough, paid little or no attention to the unexplored glaciers or to the peaks not prominently visible from easily accessible positions.

Its omissions and errors fostered the delusion long prevalent in Western geographical circles that the Central Caucasus range—which may be taken as extending from Elbruz to Kazbek—consisted of a single narrow ridge. It was left to the early climbing explorers to discover that a whole mass of great peaks (including Dykhtau, over 17,000 feet), situated entirely in Europe, had been merged in, and confounded with, the almost equally great mass which culminates in Shkara lying immediately to the south on the Asio-European watershed.

* Royal Geographical Society, January 11, 1915. Map, p. 272.

Again, the peak of Ushba, nearly as high as Mont Blanc, had, although one of the most striking and remarkable mountains in the world, been completely ignored. It is a purely Asiatic summit dominating the, at that time, almost inaccessible mountain land of Suanetia. It appears to be obvious that only those summits visible from the north side of the chain were at that time triangulated. Somewhat similar errors led to the fusing of the remarkably complicated ridges and peaks and extensive *névés* and glaciers of Adai Khokh into one watershed ridge with simple flank glaciers.

The second explorer to visit the range of Adai was a Hungarian, M. de Déchy, in 1884. He had with him the famous Swiss guide, Alexander Burgener of Saas, and a young guide, J. Ruppen. M. de Déchy is the author of a superbly illustrated work on the Caucasus. M. de Déchy ascended *one* peak which he believed to be the highest peak of the group—that triangulated by the Russian Staff as 15,244 feet, and named by them Adai Khokh. This ascent was made from the Tsaya valley on the east. M. de Déchy, led by one of the boldest and most determined guides Switzerland ever produced, certainly ascended *a* peak in the Tsaya basin; but the peak he climbed is, I think, quite clearly shown by comparing his marked route of ascent on the map given with his paper in *Petermanns Mitteilungen* for 1889, with the true orography of the group in the map (taken from the Russian 1-verst survey) accompanying this description. The peak he really ascended is the great mass with *two* tops which divides the north from the south Tsaya glacier. This peak is without name or height on any *map*, and is fully 1000 feet lower than Adai Khokh, say between 14,100 and 14,200 feet. Clear disproof of the ascent of either Tshantshakhi or Adai—apart from his map—is contained in M. de Déchy's description of the ascent in his papers in the *Alpine Journal* for 1885, in the paper in *Petermanns Mitteilungen* for 1889, and in his great work published in 1905.

Messrs. Freshfield, Moore, and Tucker, with François Devouassoud, had obtained in 1868 the name Adai for a splendid rock-peak which dominates the Tshantshakhi or eastern Rion valley on the south side of the group. Owing to his ascent having been made in mist and to the curious errors of the 5-verst map, M. de Déchy was led at first to identify his peak with this summit. Later, when the Rion peak was shown to be considerably lower than the triangulated summit, M. de Déchy came to the conclusion that he must have made an error in identification, and that in reality he had ascended the highest peak of the group.

M. de Déchy, in illustration of his paper in *Petermanns Mitteilungen* for 1889, "Das Massiv des Adai Choch," published a map of the group, which, founded on the erroneous 5-verst map, bears very little resemblance to the real facts and orographical relations of the various mountains, watersheds, and glaciers. M. Déchy has traced upon this

map a line showing the route followed to the summit of his supposed Adai.

In 1890 a third exploring party, Messrs. Holder and Woolley, with the Swiss guide Ulrich Almer, visited the district. Attacking from the Rion basin, they ascended the beautiful mountain to the south-west of the Karagom *névé* called Burjula. They also traversed the Karagom upper *névé* in its length and climbed a high peak. This was the Russian triangulated highest peak.

In 1889 the English party organized by Messrs. Freshfield and Dent to search for the English and Swiss climbers lost the previous year in the Caucasus mountains, crossed with four Swiss guides a pass in the Adai group. This leads from the east Mamison glacier to the south Tsaya glacier, and is of considerable difficulty on the north or Tsaya side.

During the late 80's and 90's the new Russian survey was carried out in the district, and in 1891 one of the surveyors, M. Kovtoradzé, is reported to have succeeded in gaining Adai from the Karagom glacier.

The name-peak of the whole group, Adai Khokh, is a striking illustration of a case where the breaking of the rule of not naming unless the real position of the native named peak is definitely known, has led to a great deal of confusion and misunderstanding. The real name of the highest peak is Uilpata. No native knows it under the title of Adai. Adai is applied indiscriminately to most of the peaks, to the massif in fact, visible from the upper Mamison and stretching from Kaltber to Tshantshakhi. The Russian surveyors have transferred the name Adai from the peaks easily visible from points outside the group to the highest—invisible—point near the centre. The 1-verst map has, however, inserted Uilpata as a secondary name. It has even gone further in the case of Burdjula, which is honoured by having printed on it no less than three separate names.

In 1907 and 1909 an Italian climber, Dr. Vittorio Ronchetti, of Milan, visited and explored in the gronp. In 1913 Dr. Ronchetti, with a companion and an Italian guide, ascended Adai, or, as he calls it, Uilpata, "to within a few metres" of the top. There the party were caught in storm, and were forced to spend the night at a height of 15,000 feet. Here he was severely frostbitten, and had the misfortune to suffer the loss of half of one foot in consequence. *This ascent was the first from the Tsaya side* of the peak. In 1913 and 1914 British expeditions visited every side of the group. Thanks to generally favourable weather, thanks also to considerable experience of guideless mountaineering and to loyal and harmonious co-operation among all the members, very considerable success was obtained. In all, nine new peaks, ranging from 13,500 to nearly 15,000 feet, were ascended. Eight cols were attained, not crossed, from about 13,000 feet, and several glaciers explored.

The map accompanying this paper, which is based upon the 1-verst

survey, embodies also all the information obtained by the various foreign and British expeditions in the group since the publication of Mr. Freshfield's map in 1893.

The Adai Khokh group consists of the mountain mass lying immediately west and north of the Mamison road. This road passes up the gorges and valley of the river Ardon, which, rising on the south of the geological axis of the chain, breaks through it at the wild and picturesque gorge of Kassara. It then flows out to the steppe region past Alagir, through the limestone gorges of the foothills, thence to join the river Terek flowing into the Caspian. On the south the group is bounded by the Mamison or upper Ardon and the Tshantshakhi or eastern Rion. On the north the Sadon valley and headwaters of the Urukh river. On the west I have taken as a perhaps artificial but convenient boundary the line of the old native glacier pass of the Gurdsivzek leading from the Karagom and Urukh valleys to that of the Rion.

The area of the mountains measuring from St. Nikolai Kazarma (the future Visp of the district) on the Mamison road to the Gurdsivzek, and from Dsinago, the highest village on the Karagom, to Gurshevi, the highest village south of the Mamison pass, is about 300 square miles. Of this close on 90 square miles is within the limits of permanent snow and ice, or rather more than all the glaciers of Elbruz (83 square miles).

In the early summer of 1914, I was fortunately able to obtain the adherence of three friends to a projected climbing—exploring expedition in the Caucasus mountains. The party thus consisted of four. Mr. W. N. Ling, of Carlisle, my friend and sole comrade of many years' guideless climbing in the Alps and Norway; Mr. W. G. Johns, of London; Mr. J. R. Young, of Glasgow, to whose photographic skill and patience I am indebted for the majority of the slides exhibited; and myself, of Edinburgh. We thus formed a thoroughly representative British climbing party. The route adopted was *viâ* Berlin, Warsaw, Moskow, thence to Rostov-on-the-Don, and from thence to Vladikavkaz, the chief city of Cis. Caucasia. The name of the city betokens its importance. It means the Lord of the Caucasus, as Vladivostock means Lord of the East, and the name Vladimir, Lord of the World. In order to make the necessary arrangements for transport, provisions, equipment, interpreter, and cook, I travelled three days ahead of the party, arriving in Vladikavkaz onJuly 3, 1913.

I had three days' hard work in Vladikavkaz, and only on the evening of the third found leisure to take a short walk up the turbulent glacier river Tcherek, which flows through the town. Many naked men were watering their barebacked horses in the stream; crowds of children were playing in the shallows. On the south-east the pale limestone precipices of the "Table mountain" rose among dark green pine forests. To the south the partly enclouded snows of Kazbek rose 14,500 feet above the town's level (2000 feet).

MARKET DAY, ONI, RION VALLEY, IMERITIA.

MAMISON ROAD (OSSETINSKÉ DAROGA), CENTRAL CAUCASUS.

MAMISON KHOKH, OR THE CURTAIN (14,200 FEET),
FROM THE SOUTH-EAST RIDGE.

TSHANTSHAKHI, NORTH-EAST FACE, FROM SONGUTA RIDGE.

The rest of the party arrived on the 6th, and after a day's packing we started for the mountains on the 8th. I had been fortunate in engaging as interpreter and climbing companion a young Russian engineer-cadet. A boy in years, he was a man in everything else. His experience had been confined to a visit to the lower ends of some of the Balkarian glaciers and the ascent of Kazbek, which does not involve any *climbing* ability. He proved an apt pupil in both rockcraft and icemanship, and was invaluable in our dealings with the frequently troublesome and erratic porters and horse-owners. His name was Rembert Martinson. He spoke Russian, French, and German, and is of Danish descent.

As cook-interpreter and tent watcher I engaged a native tribesman, an Imerition from the Asiatic town of Oni on the river Rion. This man Militan Burjeladsé was the one failure of the personnel. His love for cigarettes and vodka was as strong as his loathing of walking and work, and his incapacity as a cook only equalled by his ability at shirking. The sole disagreeable incident of the expedition, a robbery of some things from a tent in our absence, must, I feel sure, be laid to his sin of omission or commission.

We left Vladikavkaz at 8 a.m. on July 8, and drove in three lineikas across the steppe to Alagir, at the foot of the Mamison road. The lineika is a light low vehicle something like an Irish jaunting car on four wheels. It is usually in the last stage of debility and senile decay, and the harness has probably seen many generations of the small, but active, docile, and enduring horses. Near Vladikavkaz the plain is well cultivated, with vineyards, orchards, green vegetables, and maize-fields. Farther west it changes to the bare brown earthy steppe, thinly clothed with brilliant weeds and flowers, and scantily tufted with grass. The birds are—many vultures and eagles, living aeroplanes, soaring round in the blue sky; kites and buzzards at lower elevations; small windhover hawks, like our kestrel, or perhaps the lesser kestrel; grey crows; magpies near trees; hoopoes with their butterfly-like flight; crested larks; wagtails of two species, swifts, swallows, and martins; crowds of brilliant bee-eaters on the telegraph wires; finches, chats, and warblers of many species.

At Alagir we put up for the night in a semi-deserted "gostinitza," which, however, though it had nothing to eat but "yeitso" or eggs, possessed a good piano. On the 9th we drove through the gorge in the limestone foothills, finely wooded with beech and hornbeam, and reached the Cossack post St. Nikolai. Here six horses were engaged, and the baggage packed on their backs. The horse track up the Tsaya valley, which leads from St. Nikolai into the heart of the Adai group, is quite a good one. The new path does not cross to the left bank and climb up to the dirty village of Tsaya, but remains near the torrent on the right bank till not far below Rekom. Here it crosses by a bridge for which a toll is demanded. Rekom is an old wooden building in the Tsaya pine

forest, an ancient shrine, a great place of Ossetian pilgrimage in days of yore, and is so still. Many skulls and horns of "Tur" and deer, etc., adorn its walls. Grotesque birds are carved on the wooden eaves. At one time coins and other valuables used to be thrown into the interior and lay on the floor, but nowadays a locked wooden offertory box stands on a pole inside the enclosure fence.

The pine woods below the snout of the Tsaya glacier have been a summer resort and pilgrimage for hundreds of years. Just as in England of old,

> "Whan that Aprilé with his showrés swooté
> The draught of March hath percud to the rooté,
> * * * * *
> Than longen folk to gon on Pilgrimages,"

so in the Caucasus when the burning June sun smote upon the dusty plains of the steppes, the Ossetians came up to this beautiful spot to drink goats' milk, breathe the glacier air, and inhale the spiced breeze of the pines. In late years a wooden "sanatorium" has been erected in a green turfed enclosure above Rekom, and is generally fully occupied in the summer months. A small "dukhan," or shop, has also been opened, and many kinds of supplies, including "kachetinskoe" (red Caucasian wine), can be bought at reasonable prices. Good Russian bread is also obtainable—a great boon to those who cannot manage the sodden dough which is the usual "staff of life" in the mountains of the Caucasus.

We pitched our large tent for a period of twelve days about half a mile above the "Lednik," in a small opening among the pines. Close beside us raced by the turbulent torrent of the newly glacier-born Tsaya river. Above towered enormous cliffs, likened by M. Déchy to those above Rosenlaui. A small prattling brook of clear water coming down from a ravine of the Tsaya Aiguilles joined the Tsaya just below the camp, and furnished good bathing and drinking supplies. A few minutes' walk up the forest track to the glacier gave a wonderful view—a tree-framed picture of the name peak of the group and dominating peak of the Tsaya valley, Adai Khokh, with its hanging north-east glacier. The main glaciers of Tsaya and their crowd of great encircling peaks are quite out of sight; only the *débris*-covered snout of the Tsaya glacier filling the valley-trough appears from round the corner to the left. The height of this base camp was 6300 feet.

According to the plan of campaign, and in order to gain some insight into the intricate topography of the group, it was resolved to first make an attempt to ascend to the ridge of the Tsaya Aiguilles. This spur, the "splintered fence of granite teeth" of Mr. Freshfield's phrase, runs north-east from Adai Khokh and Songuta. None of its summits had been yet ascended. Three, at least, attain heights of over 14,000 feet.

On July 11, 1913, the whole party of five left camp at 5.15 a.m., and

proceeded up the left side of the valley. In half an hour the woods are quitted, and the "great kosh," the last of the summer "boarding establishments," is reached. This consists of a number of stone shelters covered with boughs and cloths, underneath the overhang of a huge smoke-blackened cliff. Koshes inhabited by goatherds, all keen "Tur" hunters, exist higher up. One of these we christened the "Doggeries," as it was guarded by a pack of particularly vociferous and bellicose big, mastiff-like dogs.

About an hour above the camp a wide scree-floored corrie opens out on the right. This was ascended, snow being reached at seven a.m., which led into a gradually steepening couloir, and so to the summit ridge at about 13,000 feet. The nearest rock peak on the west was climbed from thence. It was, by aneroid, 13,500 feet, and has since been named Tur Khokh from the abundant traces of these animals, *Capra Caucasica*, seen *en route* by the first party to ascend it. The descent on the north side of the Tur col appears easy. It leads to Dunti and Kamunta in the Urukh watershed. Two days later another of the Tsaya Aiguilles was climbed. This is the point to which the figures 4294 M. are attached in Merzbacher's map. It was named Ullargh Khokh from the abundance of the bird for which that is the native name. This is the great Rock partridge, *Tetraogallus Caucasicus*. It is like a huge ptarmigan, but possesses, instead of the frog-like croak of that bird, a loud, clear, musical-scale whistle which rang round the rocks above the high camp (9000 feet) just at dawn. The camp was on grass below the moraine of the small nameless—since called Ullargh—glacier coming down from the south face of Ullargh, and the unnamed peak between it and Songuta to the west. Some good views and photographs were got from Ullargh of the northern mountains of Karagom, all hitherto unascended, and several well over 14,000 feet high.

One of the chief objects of the expedition to the Adai group was the ascent of Tshantshakhi, and to settle conclusively whether this could have been the peak ascended by M. de Déchy in 1884. M. Déchy had most positively stated "the ascent was made by the north-east arête." We had, therefore, to find this side of the mountain. The maps led to the belief that we should find it in the southern Tsaya glacier basin. Accordingly the next expedition was arranged for the investigation of this. On July 16 we left Tsaya camp with light tents and provisions for two days. We had engaged two herdsmen, father and son, as porters. The Ossetian mountaineers, like almost all Caucasians, though wiry and enduring, are not of powerful physique, and are unaccustomed and unwilling to carry burdens such as Swiss porters often do. I think some exploring climbers, both English and foreign, have sometimes failed to realize this difference, and have had trouble in consequence. As we were taking these men at any rate up the first icefall, we provided them with properly nailed boots. These they put on their naked feet with great

pride. All Caucasians wear soft hide shoes. We followed the excellent track up the left moraine to the foot of the great cataract of the first icefall. We crossed high up a rubble and ice gully—owing to absence of snow, somewhat dangerous from falling stones—and gained a snow-slope on the left above the steeped part of the fall. As the snow was hard and steep, I cut steps for the porters. It was interesting to observe how they negotiated this passage. The Caucasians with gloved feet are accustomed to place the whole foot flat upon a slope in order to obtain the best hold. They are quite good climbers upon *rocks* of moderate difficulty. They are, of course, helpless upon an ice or hard snowslope. The elder man still tried the old method in his novel footgear. The boy watched us and imitated quite successfully our way of driving our toothed boot-edges into the slippery surface.

A short distance above this and just below where the north Tsaya glacier plunges in riven cataracts of seracs between towering walls of rocks, is the last grass patch. Here tents were pitched at a height of 9300 feet. Some of the party saw the porters safely down the snow-slope. I made an investigation of the north Tsaya icefall. I was forced to the conclusion that it was too dangerous at present. The steep ice-slopes up which it would be necessary to cut a way were continually being swept by boulders, stones, and blocks of ice. This confirmed us in the intention to ascend the southern glacier's icefalls, which had not been found difficult either by Mr. Freshfield or Dr. Ronchetti's parties. We left this high camp at 1.45 a.m. on July 7. After having been forced almost to the right bank by the enormous crevasses caused by the inflow of the north Tsaya icefall, we recrossed to the foot of the high rock—the foot of the great spur which separates the north and south Tsaya glaciers. This is marked by Merzbacher as 3092 M., and as it is the pivotal point in Mr. Woolley's panoramas taken from the lower Tsaya glacier, I have ventured to name it Woolley's rock.

The second icefall here is high and intricate, but not seriously difficult. Above this a third icefall is encountered of less importance. This surmounted, an almost circular snow basin is entered upon, walled round with peaks of steep rocks and ice. On the right a long high-ridged mountain mass *with two tops* sweeps up to well over 14,000 feet. This is marked in Mr. Woolley's photographs as "Mr. Freshfield's Double Peak (or Bubis?)." On the left the well-marked peaks of Dr. Ronchetti's "Triple Peak" (showing, however, from here as two peaks only) rise between the Mamison pass and Tsaya. Below the lowest gap on their eastern side the "Freshfield Perival" (pass) of 1889, approached by somewhat repulsive-looking steep avalanche-grooved snow-slopes and not too easy rocks, leads up to the east Mamison glacier on the north side of the Mamison pass. No signs of either Adai or Tshantshaki were visible. We therefore resolved to attempt the ascent of this "Double Peak." We attacked it by a rocky arête falling from

the main ridge in a south-easterly direction. The arête developed difficult rock climbing with much loose stones high up, and with a party of five progress to be safe was necessarily slow. About 2 p.m. we reached a minor top, 13,800 feet by aneroid. As even the east peak was a long way off and about 500 feet higher, and the weather had now turned threatening with snow and cold wind, the ascent was given up. We had, however, got a splendid view of Adai's south-east face just across the *névé* basin of north Tsaya, and a route could be planned upon it which would make its conquest a certainty. This route is almost identical with that by which Dr. Ronchetti's party made the first ascent of Adai from Tsaya. We also saw, though only partially and through mist, a threatening vision of an enormous black cliff at the head of the north Tsaya basin, which could be none other than Tshantshakhi's north-east face. The mountain, therefore, does not possess a "north-east ridge." The hopeless-looking appearance of this face, while it increased our desire to conquer the mountain, warned us of the almost certain failure of an attempt from the Tsaya basin. We therefore resolved to shift camp to the headwaters of the upper Mamison.

We returned by the route of the ascent, shortening the passage of the main icefall by jumping down from the sneering upper lips of some big crevasses. We reached the upper camp at 6.30, packed up, and heavily laden, gained the lower camp at 9.30 p.m., after a twenty-two-hour day. On July 22 we struck camp, after the usual misunderstandings and delay in getting horses. The horses promised for six o'clock of course did not come, and it took two hours to get others. The men knew nothing about loading them, and in consequence the packs were continually falling off. It therefore took four and a half hours to get down to St. Nikolai Kazarma, a walk of about two and a half hours. Mr. Young and I were the rearguards, somewhat temper-rasped and semi-starving, who reached St. Nikolai at 12.15. We only managed to obtain one lineika and an arba, the latter a small rough cart drawn usually by a pair of little oxen. We drove and walked through the fine gorge of the Ardon at Kassara, and stopped at a "gostinitza" of sorts below the ruins of King George of Georgia's castle, at Saramag, for a meal. Here we procured two horses, which Messrs. Ling and Johns rode up to Kalaki Kazarma, the highest permanently inhabited spot on the pass.

The men of the lineika and arba and our own Imeritian cook had been imbibing vodka during our halt, and our drive up the pass was considerably enlivened thereby. The cook had managed to beg, borrow, or steal a white horse, and kept shouting and singing in great style. He continually charged up in the rear and incited our men to race. The road is not adapted for this. It is carried at a great height along a precipitous slope above the river. There are no parapets or fence of any kind, and the surface is about as bad as anything pretending to be a road at all could have. My friend was seated facing the inside cliff, and

risked being swept off by projecting boulders. I frequently found myself looking between my knees at the foaming glacier torrent 500 feet below as the erratic driver now pulled his steeds first to one side of the road and then the other. At last, when I had almost made up my mind to use my iceaxe, with which I was frequently obliged to threaten the cook, to stun the driver, in order to load him on the lineika and drive myself, an incident occurred which sobered him somewhat. He had got down to lead the horses for a bit, and was walking, or rather lurching, along the very edge when all at once he slipped and disappeared. He had, however, twisted the reins loosely round his arm, and with wonderful quickness, assisted by the frightened horses jerking themselves back, he climbed up again and walked on as if nothing had happened. We did not reach Tib before dark. Here we were surrounded by gesticulating, shouting crowds climbing up on the vehicle, so that I was obliged to push them off. It looked like attempted highway robbery at least. At last in a lull I managed to find out that they only wished to furnish guides for the kazarma, as the "daroga" or road was quite impossible. I ordered the procession to move on at once. We found that, in fact, the road, though not good, was much better than lower down, and we got to the kazarma all right about 10 o'clock. This kazarma is much frequented by people and traffic between Cis and Trans-Caucasia. Many arbas and pack-horses were put up in the yard, and the three rooms available, full of a crowd of many different tribes, so that we preferred to put up our light tents outside. The traffic is chiefly timber from the south and salt and provisions from the north side.

Next day we took a couple of pack-horses up to the highest earth patch—10,100 feet—below the huge and disproportionate moraine of the Mamison west glacier. This upper Mamison valley exhibits the peculiarity of containing two parallel glaciers only separated by their two lateral left and right moraines; both glaciers are in strong retreat. The lowest of these and the one which leads to the lowest gap for many miles in the Tsaya Mamison watershed, the Freshfield Pass, has been named the West Saramag glacier by my friend, Dr. Ronchetti. I think, however, that though it certainly does flow off the south-west flank of Saramag peak, it is nevertheless a Mamison valley glacier. Saramag has already a large and fine glacier flowing off its eastern side, and the transference of the name Saramag to this side is likely to lead to confusion. As Dr. Ronchetti's peak, "the Triple Peak" or Ronchetti Khokh, forms its western source, a more suitable name for it would be the Ronchetti glacier. Meanwhile I have described it under the name of Eastern Mamison glacier, which defines its position as one of the sources of the Mamison river. From this camp on consecutive days the two highest summits to the west and east were ascended. The west summit is that triangulated on the Russian 1-verst map as 1897 Sazhens = 13,279 feet and unclimbed, but I think the triangulation is on a lower point, and the

ridge is higher. Merzbacher has called it Mamison Khokh, 4048 M., 13,279 feet. The route was up the moraine and the Mamison west glacier, then up the ridge separating Mamison valley from Tshantshakhi valley. The summit is a long, sharp ridge of rock with a great precipice impending over the south Tsaya glacier side. Dr. Ronchetti considers that this summit is not sufficiently important to bear the name of Mamison, and would transfer or apply that name to the next peak on the north-west. This is the great "double peak" already described from the Tsaya valley. Though almost entirely a Tsaya massif, this great ridge originating in the sharp spur of Woolley's rock runs south-west for more than 2 miles. Its highest point is at its south-western extremity. Here it presents a steep rock bastion towards the head of the Tshantshakhi glacier, and is thus a near neighbour of Tshantshakhi, though considerably lower.

The point ascended by us on July 24, 1913, might perhaps be called Mamison Shoulder. The night of July 24 was bad with heavy rain, wind, and thunder. The morning got somewhat better, but we did not get away from high camp till 5.45. The east Mamison glacier was then ascended to the col of Saramag. From there the watershed rock-ridge was climbed to the top dominating the east Mamison and also the Saramag glacier. It is triangulated on the 1-verst map as 1970 S. = 13,790 feet, but has no name. Merzbacher has applied the name Saramag to an insignificant hump about 2 versts south of this. Our summit, to our surprise, proved to be crowned by a large and well-built cairn. A tent platform had also been constructed somewhat below the top. The peak is evidently easily accessible from the Saramag glacier, and must have been reached from thence by a Russian survey party. It may be considered as entitled to the name Saramag.

We had now to think of one of our main objects, the conquest of Tshantshakhi. Our views of its north-east face did not show any route which seemed free from very considerable danger and difficulty. As the north face consists of black rock precipices, the north-east is heavily defended by hanging glaciers. We therefore resolved to press an attack from the Tvilisa glacier on the south-west. We now engaged an arba and crossed the Mamison pass, 9280 feet, to Tshantshakhi kazarma, on the Rion (Asiatic) side. At the top of the pass is open in summer a small "dukhan" where tea, bread, wine, and vodka can be got. Also a room (there are two) to sleep in if the weather is bad. The road had only recently been opened through a heavy snowdrift on the east side of the ridge. By driving a tunnel through the soft and narrow shale ridge here, the pass could be kept in use for probably two months longer than at present. So gradual is the rise on the east side, and so well engineered is the road, that only one zigzag has been found necessary. It is much steeper on the Asiatic descent. The Tshantshakhi kazarma lies about 1200 feet down on the west side. It is a large, strong

stone building with several good rooms for travellers. It is often full to overflowing when bad weather prevents the crossing of the pass. A small belfry contains a bell, which is rung in snowstorms for the guidance of wanderers.

The day after our arrival, Sunday, July 27, was very bad, thick mist and driving rain, and very cold. We mostly lay in bed, wrote, or mended clothes, etc. Tshantshakhi's lower rocks, when they showed up occasionally, were white with new snow.

Tshantshakhi sends down to the south a huge rock ridge cut up with gigantic obelisks and pinnacles of black rock, separated by steep snow and ice couloirs. Where this ridge sinks into shale and grass at the source of the small stream falling into the Tshantshakhi torrent at the kazarma, a shepherd's track leads over to the Tvilisa valley. On July 28, leaving the kazarma at 10 a.m., we crossed over here to the Tvilisa glacier, and followed up the left moraine to a rocky slope, level with its first icefall. Here we bivouacked—not comfortably—on loose blocks of rock at 10,500 feet. I found an almost perfect egg-shell of the great Rock partridge, *Tetraogallus Caucasicus*, below this. We started, after a rather cold night with snow and sleet, at 4 a.m. on July 29, found a way, guided partly by mouse and marten tracks, through the three icefalls of the Tvilisa glacier—very complicated—and attacked Tshantshakhi by its south-west face. Here a steep ice couloir runs up between the first rocks on this face, and a very steep ice-slope leading to the col on the south ridge below the final peak of the mountain. We all wore crampons, but heavy cutting was necessary before the Bergschrund was crossed at 9 a.m. First an ice-slope and then a steep rock chimney with overhung exit led to a small rock platform. The rocks above were unclimbable, so return was made to the ice couloir. After ninety minutes' hard cutting the angle became hopelessly steep. Escape was effected through a crack in the overhanging ice of the couloir's left edge on to the open ice-slope beyond. On this becoming too steep for crampons to hold, the party cut back to north to a rock rib running far up the south-west face of the peak. The rocks here, though almost vertical, were "good." Owing to the new snow and ice on them the crampons were not removed. By this and several other rock ribs good progress was made. Higher the rocks died out, and steep ice thinly covered with new snow made the climbing both difficult and slow. At length, however, the south ridge was reached not very far below the top, and the climbing became relatively safe and easy, except for a fierce and very cold wind. At 3.45 we reached the highest point, a narrow rock ridge capped by 2 feet of new snow. In spite of the driving and clearing mists and whirling snow-dust, it was clearly made out no higher point existed, and the aneroid, which had agreed almost exactly with the Russian triangulated top of Saramag, made the height 14,500 feet. Owing to difficulties encountered the hour was rather late, 3.45 p.m., so that only fifteen minutes could be allowed for cairn, records, and food. At 4 p.m.

the descent was begun by same route. Owing to bad conditions, the utmost care was necessary, and the pace was slow. In the gathering darkness the ice-crack giving access to the couloir of ascent was missed. However, all the party were safely established in another crack, and, fastened on to 140 feet of rope, the leader was lowered over into the couloir. It is astonishing how time flies under such circumstances, but it must have been fully two hours later before a sufficient staircase was constructed to the steps of the morning in the couloir. The leader then came up to take the post of sheet-anchor in the depths of the crevasse, and the descent was resumed. The rock platform was at last gained at 10 p.m.

At five we managed to get under way again, descending the overhanging chimney below the platform to the ice-slope above the Bergschrund. Crampons proved of great service on this descent, and the bivouac was safely reached at 8.30. Here a good meal and rest put the party in good trim for the heavily loaded trudge over the ridge to the kazarma. On the way we met our photographic member, Mr. J. R. Young, who, somewhat anxious at our prolonged absence, had engaged a porter-shepherd and come to seek us.

In 1914 another British expedition paid a visit to Tsaya and Karagom valleys. The party this time consisted of Mr. R. C. Richards, of London, Mr. H. Scott-Tucker, of London, under the same leader. We had again the excellent companionship, and able service in dealing with the natives, of young Martinson. This time a much better cook was obtained than the rascally and lazy Asiatic (Imeritian) of 1913. He was a Russian soldier named Miranoff. He was small and somewhat timid, and easily humbugged by the natives, but clean, willing, and quite a decent cook, though wholly devoid of all initiative. He was quite a dandy in his way, and I was forced to make him leave at St. Nikolai, on the Mamison road, more than half of the large supply of bedding, spare clothes, and luxuries he had brought with him. His shaving mirror, however, proved useful on several occasions, as we had brought none of our own.

We arrived and set up our tents on the old site of 1913, in the Tsaya pine forest below the glacier snout, on July 12. Fortunately we had reached the Caucasus just after, not before, a terrific burst of rain-storms which had swept Europe from France to the Caucasus. The railways were washed away in places, and the Mamison road, never much of a road at any time, had in parts completely disappeared. Of course we were told at Vladikavkaz that it was absolutely impossible to get to the mountains for several weeks. My reply to that was to order the lineikas for the next morning, and we got through—with difficulty naturally—in two days.

In order to investigate the problems of a Tsaya-Karagom pass, first suggested by Mr. Freshfield and still unsolved, it was resolved to attempt the Adai-Songuta col, and from there, if found practicable, make the first ascent of Songuta. Two hunters were engaged as porters, and high camp

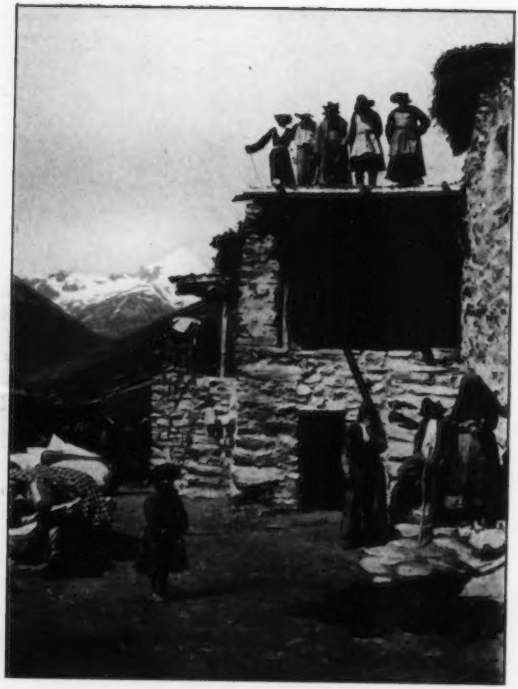
pitched (9000 feet) on last glass below the terminal ice-cliffs of the hanging glacier of Uilpata on July 14. Of course porters were never taken beyond the camps. Leaving camp at 3.5 a.m. on the 15th, the right moraine under the south-east spur of Adai was followed to the glacier. This glacier is formed in a very peculiar manner. I know of no parallel case in the Alps, Norway, or Caucasus. Imperfect observation of it from a distance has led to very erroneous delineation upon the 1-verst map. On the north-east face of Adai can be seen from far off a great hanging mass of ice. Below this an almost three-parts circular *névé* basin sweeps round below Adai, the Adai-Songuta col and the south ridges of Songuta. While the major part of the ice pours over a great cliff to another almost flat circular basin below the south-east spur of Adai and Songuta's south ridges, a portion escapes through a deep gap cloven between Adai main peak and its south-east spur to join the north Tsaya glacier.

The ice-crowned cliff between the upper and lower basins of the Uilpata glacier can be passed, though not without difficulty, on either side. After passing through an easy icefall we gained the lower basin. From there we ascended the rocks of Songuta's south spur, and traversing left when those became overhanging, gained an ice couloir between these rocks and the central ice-cliffs. At the top of this we then entered the upper snow reservoir. The direct col appears impossible, as it is guarded by an enormous cornice. We gained the watershed ridge by attacking a steep rock rib of Songuta. Owing to the bad condition of the steep rocks of Songuta's final peak the ascent of that mountain was not completed. The descent to the Karagom *névé* on the north side of the pass I ascertained by descending a couple of hundred feet, to be quite easy. The difficulties on the south side will, I believe, always be considerable.

It was then resolved to make an attempt on the second highest summit of the group. This is the strikingly shaped mountain which Mr. Freshfield has styled tentatively as the "Double Peak" in his work. It is credited with a height of 14,874 feet in preliminary sheets of the 1-verst map. It consists apparently of two—there are in reality three—sharp rock peaks separated by a huge vertical-looking snow couloir. It lies between the "Shoulder" of Adai and the broad snow peak "like the Grand Combin" of Tvilisis Mta at the west extremity of the North Tsaya glacier. High camp was pitched on July 19 on last grass at 9300 feet just above the first icefall of the Tsaya glacier. It was interesting to note that our two hunter-porters employed "crampons" of knotted rope fitted to their gloved feet for use on the steep snow slope by which the first icefall is passed. The rocks above here are an evident haunt of Tur, and the men brought with them their rifles and disappeared in search of the big goats whenever relieved of their loads. I employed several hours of the afternoon in hunting for a passage through the rocky walls barring access to the North Tsaya glacier on this east side. The climbing was

ADAI, OR UILPATA (15,244 FEET), FROM CAMP IN TSAYA FOREST AT 6300 FEET.

THE NORTHERN MOUNTAINS OF KARAGOM.



NATIVES OF KALAKI (OSSETES).

SUMMIT OF THE MAMISON PASS (9280 FEET).

very steep and by no means always easy, and I invariably found myself cut off from access to the North Tsaya glacier by vertical walls some hundreds of feet high. We therefore resolved to seek a way round the North Tsaya icefall and follow the route indicated by Dr. Ronchetti in photographs sent me. On Monday, July 20, high camp was quitted at 1.5 a.m. Passing up the main Tsaya glacier, we climbed a steep snow- and scree-filled gully, which cuts off "Woolley's peak" from the ridge behind. This gives an easy access to the North Tsaya glacier above its formidable icefall. We then traversed this glacier in its whole length to the foot of the "Double Peak," or, as it stands at the head of the Bubis valley and glacier on the south-west side, it is, I think, preferable to call Bubis. The ascent was made to the dividing col of the chief peaks, mainly by the great couloir. This couloir is upwards of 3000 feet high, and is pitched at a very steep angle. Fortunately, owing to the late bad weather and heavy snowfall, the ice was covered for the most part with good adhesive snow. Late in the season, and in good weather, the route may easily be impossible. An attempt to utilize the ridge of the south peak had to be abandoned owing to the excessive steepness and also rottenness of the rocks.

In leaving these rocks for the couloir again an incident occurred which showed the necessity of the precautions adopted. The snow up here was thin and becoming treacherous. While crossing a space near the rocks the leader and last man on the 100-feet rope being both on rock the snow slipped off beneath the two central climbers. Fortunately the end men were watching, and the others were stopped with comparative ease. From the col, reached about twelve noon, a short climb up a corniced ridge led to the summit of the south peak. This consists of a sharp rock point now covered with about 2 feet of fresh snow. It was impossible to detect any difference in height between this peak and its twin summit to the north. Its superiority in height over all the peaks of the group (except Adai) was very evident. Its only possible rival is the beautiful mountain, Karagom, on the other side of the Karagom *névé*.

The descent to the Karagom *névé* looked fairly easy, but this col could never be employed as a convenient passage for the Tsaya-Karagom watershed. The best pass may possibly be found between Bubis and Tvilisis-Mta, but this would be a double pass, across the top of the Bubis glacier, before reaching Karagom *névé*. Probably the actual easiest, though a very high pass—over 14,000 feet—will be by Dr. Ronchetti's route of ascent to the south ridge of Adai. The return route was to a great extent by the route of ascent. High camp was not regained until after dark. The condition of the snow on the glacier remained very troublesome, crusted, and bad all day and night, and rendered the ascent extremely laborious and fatiguing. The magnificent scenery of the North Tsaya and Karagom glaciers, and the successful assault of the fine peak

of Bubis amply compensated for all this. Most impressive views were obtained of the tremendous black cliffs of Tshantshakhi's north-east face which dominates the south corner of the North Tsaya glacier.

An expedition which was planned to combine the ascent of Tsaya Khokh with the passage of the Tsaya Col to Kamunta was frustrated by a tremendous cloud-burst which struck the range on July 22. The rain was the heaviest I have ever seen and did a lot of damage in Tsaya forest, many pine trees being torn out by the roots and being carried into the Tsaya river by the water. The new bridge was also carried away. This involved the resumption of the old path which climbs up past the villages of Tsaya high above the gorge on the left bank.

On the 23rd we descended to St. Nikolai by this route. These villages are poor, the scanty clothing of the children—some wore none—is ragged. The men were engaged in a kind of shooting match. We met numbers of the children lower down who had been across to the Tsaya woods to gather bowls of very fine strawberries. They were very persistent merchants of these. Five versts below St. Nikolai the Sadon valley comes in on the left. We turned up this. Blasting for the new electric waterpower track was going on, and many men were at work rebuilding the washed-out road. Numbers of these men were Turks, with red fezzes, from beyond Armenia.

Sadon village looked as though recently bombarded. Many houses destroyed, others with fronts or sides cut away, giving a view into the interior where domestic work was calmly being proceeded with in public. There is a good store or "dukhan" here, where excellent Russian bread was bought. Many other things are to be had also. We got across the stream here by a long plank, but a good deal of difficulty was experienced in getting the horses over the swift current, one being almost washed away off its feet. Owing to the destruction of the bridges, the "trek" up the Sadon valley to below Sgid was troublesome. We camped here for the night in a disagreeable drizzle of rain. It was wonderful to notice, however, how quickly our horsemen produced a good fire with most unpromising sodden green bushes.

The next day's walk was over the Sadon pass, 8000 feet, to Kamunta. Sgid is a fair-sized village with a good new schoolhouse. A man here had a fox cub as a pet. The country above is bare green hills covered with very rich grass. On the north rise the battlemented limestone mountains of Kion Khokh and its neighbours. The Tsaya ridge to the south was mostly enveloped in clouds. The track is good, and easy going for the horses, though muddy in places with the recent heavy rains. A long ridge of soft dark shale leads down to the stronghold village of Kamunta in the Urukh basin. All wood and water must be carried up to this village from far below. The houses are built of enormous blocks of stone, cyclopean walls without mortar. In the cemetery above the village the corpses of the former inhabitants can be seen, lying in rows,

through large holes in the stone mausoleums. We stayed here along with two Russian travellers in a single small room belonging to the dukhan keeper. I was here surprised to find, along with several other books, a Russian treatise on aviation!

On July 25 we walked from Kamunta to Dsinago, descending the valley of the Agamugi by quite a good road, on which it would be possible to drive in a *lineika* to its junction with the Urukh river; then up this river to Dsinago. This is a semi-Mohammedan village, and we passed several inhabitants engaged in evening prayer along the roadside. There is a veterinary post here in charge of a Dr. Sergius Alexandrovitch Iokelson, to whom we introduced ourselves, and were invited by him to camp in the enclosure, and did so later. Now, however, we were bound higher, and only stayed long enough for a meal, and to hire four donkeys to convey baggage to a camp as far up the right bank of the Karagom glacier as possible. These donkeys are sturdy little beasts and very strong. Unfortunately, they seem to fancy themselves as singers and as cocks, and evening and dawn in this valley is rendered an aural inferno with their rasping brays.

The country at Dsinago is a fairly wide valley-flat, with a good deal of cultivation. A few versts above, the track enters a fine forest of pines, and climbs up steeply, soon mounting high above the moraine-covered ice-tongue of the Karagom glacier. We pitched tents in a small flat behind the right moraine, where many signs of other camps already existed.

On the following morning I walked up the glacier for a couple of miles till the icefall became too complicated and difficult for further progress. The remains of a hooded crow seen here. The Karagom icefall is a magnificent sight, pouring out of huge rock portals on either side in a tumbled mass of seracs. The upper fall is not less, I think, than 2000 feet high. The whole nearly 4000 feet. Sharp high rock peaks streaming with snow and hanging glaciers rise on all sides. There are quite distinct traces of the path, which here descends the moraine for the crossing to the Fastag glen and the Gurdzivzek to Gebi.

On the 27th we left at 8 a.m. for a high camp to explore the northern peaks of Karagom.

In about two hours, partly by moraine, partly on the glacier itself, we reached an exquisite little tarn which is well called "The Blue Lake." It occupies a space dammed up by the moraine with steep rocks on its east side. Beyond this the side hills fall back, and a wide grassy space of alternate ridges and flats of ancient moraines covered with rhododendron or turf comes into view. We climbed the grass slopes in the direction of the north Karagom glacier to a height of 9000 feet, and here pitched the high camp. The spot was a small flat just below a chaos of gigantic boulders. I prospected in the afternoon 1000 feet higher to the moraine of the glacier, but could not see over the ridge Saudor running up to join the great wall of Karagom. We left high camp at 1.15 a.m. on

July 28, and ascended to the right moraine of the north Karagom glacier; then steep screes, ice-slopes, and rocks to the narrow and corniced ridge of Saudor. From here (about 12,000 feet) Skatikom (14,600 feet) is not visible on account of a sharp little three-peaked mountain rising on the Karagom ridge.

Turning due south along the ridge we crossed a col, found a way through a small hanging glacier, and gained the watershed ridge at a snowy hump (about 13,000 feet). Turning at right angles to the east, we climbed along the watershed ridge over a number of steep and sharp rock towers. Three separate tops were ascended. From the last only did the grand peak of Skatikom become visible on the other side of a wide, deep depression connecting Karagom *névé* with Skatikom *névé*. The height here was about 13,600–13,700 feet. Fine views of all the Karagom peaks. Adai-Khokh looks very well here, and easily shows its dominance. This peak I have ventured to name Vologata, though its connection with that glacier is not very direct. It is really in the Skatikom basin. As the day was yet young, 11.20 a.m., we now resolved to attempt the ascent of the highest point on this massif. This is the east summit of Karagom, and accordingly we retraced our steps to the snow hump at the junction of the Saudor ridge. Thence a descent of about 300 to 400 feet placed us on the col below that peak, height about 12,700 feet. The 2100 feet thence to the top of Karagom gave some interesting climbing, mostly on a corniced ice arête where considerable care, judgment, and labour was necessary in dealing with the frequently unstable snow surface. The first rocky top reached proved not to be the highest point. That was not gained till 4.45 p.m. The west summit was fully a verst distant and is distinctly lower.

Most splendid views of all Adai peaks, and of the giants Dykhtau, Koshtantau, and the other central peaks. The return journey, begun at 5.15 p.m., was hastened by a most threatening appearance of the western heavens. It was delayed by the very bad and soft state of the snow. Only the outskirts of the storm really reached our length, but the sunset seen from the Saudor ridge at 12,000 feet surpassed anything any one of us had ever seen in his life, of sublimity and awful grandeur. The vast black clouds hanging over the huge cones of Dychtau and Koshtautau, rent in every direction by the zigzags of the lightning, seemed to take fire as the sun dipped, and the whole spectacle was that of a world in flames. Owing to bad snow and difficulties on the moraine in the dark, we did not get back to camp till nearly midnight. It was a hard day of twenty-four hours, but a very repaying one.

The following morning we shifted the light camp down to Karagom camp, bathed and rested. Next day went down to Dsinago, where we camped in Dr. Iokelson's enclosure. Dsinago is a good place for provisions. We got eggs at 1 ruble for 100, and the bread was well baked, of wheat with a proportion of rye. This village is an excellent centre for

mountain excursions and ascents; it is also at the foot of one of the easiest glacier passes across the main chain. Transport is abundant and prices reasonable. It is certain to develop largely in the future.

We now resolved to pay a visit to the Laboda group, the highest summit of which, Laboda, had not yet been ascended. Messrs. Dent and Woolley had ascended Ziteli, a lower point of the group, in 1895, and Mr. Dent's map accompanying his paper, with his admirable description, shows the route very clearly. Our ascent of Laboda was made from a high camp on the left moraine of the Tana glacier on August 1. It was by the east ridge, of rock mainly. The actual summit is a high cornice of snow, about 80 feet above the last rocks. The height of this peak is 14,170 feet.

Unfortunately, it was misty on the summit and only very partial views were obtained. It should form an admirable view-point for the Central Caucasian peaks, rising as it does immediately south of the Shtuluvzek, and neighbouring not remotely the great masses of Shkara and Dykhtau. The climb was interesting and very steep, though the difficulties were not serious. On our return to Stir Digor from Laboda, on August 2, we got the first muttering, though we then failed to realize this, of the great war so soon to sweep over Europe. One of our porters, who could speak a few words of English (picked up on the Vancouver railway), said, as we paid him off, "My brother, he soldier, he go way. I do' know." Again, the horses ordered for next morning at four were, late at night, said not to be available, owing to all horses requiring to be inspected by the military authorities. On my insisting on contracts already made being carried out we eventually got them.

It was not until reaching the railway at Elchatova station, however, that we learned of war's actual outbreak. The railway was in the hands of the military authorities, all trains said to be stopped except troop trains, pouring men *south*. "Austria had attacked Servia, and Russia was going to fight *Germany* in her defence."

What affected the Caucasus more was that the scoundrelly adventurers in German pay, who ruled at Constantinople, were expected to throw Turkey at once at Russia's Asiatic frontier.

The expedition eventually got back to London in three weeks, after a slow and roundabout but very interesting journey through the Sea of Azof and the Black sea (from Rostov), the Crimea, Odessa, Varna, Constantinople, Greece, Italy, Switzerland, and France. Though thus only half the Caucasian programme was accomplished, the information gained of the Adai group was tolerably complete.

The PRESIDENT (before the paper): I must, in the first place, point out that the Caucasus to which our attention is turned to-night is not the region which is now a seat of war. It is somewhat unfortunate that the expression "the Caucasus" is commonly used in this country in two different senses—a political and a geo-

graphical one. In the political sense it covers the portion of the Caucasian isthmus that forms part of the provincial administration seated at Tiflis, and includes Georgia and a large portion of Armenia. It is in the Armenian highlands that fighting is now going on. In a geographical sense the Caucasus is a mountain range. The distinction is well marked in the *Encyclopædia Britannica* by the use of Caucasia for the political province, and Caucasus for the chain. Now, the mountain chain of the Caucasus may be simply figured by a letter Y, the stem being to the west towards the Black sea. Its whole length is about 650 miles, and that of the stem about 300. The inside of the fork of the Y is occupied by a highland district, known as Daghestan, the Mountain Land, formerly the home of Schamyl. The Chetchens, who are now fighting for Russia in Poland, were among his followers. To-night we are dealing only with the stem of the Y, and only with a little knot on that.

Before, however, Mr. Raeburn reads his paper, I may make some brief remarks on a region I know well. It is forty-six years to-night since I gave the Society what I may venture to describe as the first authentic account of the "Frosty Caucasus." This evening I limit myself to one point—the relation between the geology of the region and its river-courses and passes. This relation is curious and has often been imperfectly appreciated. The Central Caucasus is not, as is sometimes stated, a single ridge. It is nearly as broad as the Alps, say, at the St. Gothard. Roughly speaking, it consists of three parallel ridges, a central crest of granite with fringes broader on the north than on the south, of crystalline schists. These are bordered on the north by a limestone range and on the south by a range of Palæozoic slates. You may notice that from north of Sukhum Kale the granites form the watershed as far east as the river Ardon. From this point, first the Ardon and then the Terek break through the granite. Farther west each northern river has made a fine gorge through the limestone, but these two have still deeper ones through the granite, one of which is the famous Dariel. This was the Caucasian pass known to the Romans, and in the centre of the gorge stood the castle of Queen Tamara, which succeeded a Roman fort.

Now let us look at the consequences on human traffic. The central granite crest for 100 miles nowhere falls below 10,000 feet and is uniformly rugged and glacier-clad. Consequently, the two military passes practical for wheels, break through it by the gorges of the Ardon and the Terek and then find a much easier watershed. The famous Cross pass to Georgia and Tiflis creeps under Kasbek and goes over the southern slates; the Mamison pass leading to Imeritia and the Black sea slips over the bank of soft schists that links up the watershed where it is transferred from the granite to the slates. One other detail I may mention. Between the military horse-track of the Klukhor, leading to Sukhum Kale, and the Mamison there is no pass not over glacier, but there are places where the glaciers can be traversed by cattle and horses, as the Zermatt St. Theodul was in early times. One of these horse-passes was marked on old Russian maps as the Pass Mta, and since it is exactly over the source of the ancient Phasis it is at least pleasant to think we have here a link with the Golden Fleece. You can now recognize the important position of the Adai Khokh group. It stands at the point where the granite range is first broken on its eastern flank by the Kassara gorge. It is one of the principal groups, or massifs, of the Central Caucasus, the others being the Elbruz spur, the Ushba group, the Dykhtau group, and the Kasbek group. Its highest peak is about the same height as Monte Rosa. It contains one of the finest glaciers in the whole chain, the Karagom. I described the first and as yet only passage of its icefall, nearly 4000 feet high, forty-six years ago. The peaks above it I left to my successors, and Mr. Raeburn will describe them to you to-night.

The PRESIDENT (after the paper): I am sorry to say we have had several disappointments. We hoped to have had here Dr. Felix Oswald, who has studied the geology of the Caucasus and constructed a very detailed map illustrating it. If there is no one here who is anxious, or able, to take part in the discussion of Mr. Raeburn's paper, I will add a few words from my own knowledge of this region. In the first place I desire that we should not go away to-night without paying the thanks that are due to the Russian Government for the consistent courtesy which during the last fifty years they have shown to English travellers in the Caucasus, and that at times when the political relations between the two countries were very different from what they are now. English travellers in the Caucasus have been received by the local officials with a kindness altogether surprising; not only have Cossacks been put at their disposal to help in the villages, or to bring up letters from the post two or three days' journey off; not only have these facilities been granted us, but we mountaineers have also had put at our disposal privately-published maps and even manuscript provisional sheets of the surveys in progress. Thus we have been enabled to bring to the notice of Western Europe authentic maps of the Caucasus earlier than would otherwise have been possible. I would also include in this expression of thanks the native princes, as they are termed—they are really somewhat in the position of Highland chiefs—who have always been extremely good to English travellers. I was much touched two years ago ago (1889 was the last year I was in the Caucasus) by receiving a message from the Prince of Suanetia that he hoped I would soon come again, if I was not too old, and at any rate that I would send some of my countrymen.

The paper we have heard to-night has been in the main, of course, a mountaineering paper—and mountaineering, if it helps to topographical exploration, may seem not to have much direct scientific result. In the case of the Caucasus it has had this practical result; it has added a new playground to Europe, and, as the Alps get more and more overcrowded, it is a great thing that there should be no further off from us in time than the Tyrol was when I was a boy, mountains where we can enjoy real primitive travel—change of life and of company as well as change of scene. There are many attractive aspects of this country which it would be impossible to go into to-night, but which are interesting to scientists of different kinds. The Caucasus, of course, is a great field for the botanist; it is also an extraordinary field for the ethnologist. The Ossetes who live about Adai Khokh have many curious customs and legal institutions, which were dealt with by Mr. Delmar Morgan, who was for a long time a member of our Council, in a translation of a paper by Prof. Kovalevsky, published in the *Proceedings* of the Asiatic Society. One point which has struck me in the paper read was the illustration it afforded of the origin and growth of human feeling towards mountains. We are often told there were no relations between men and mountains in the old days except those of dread and dislike; I do not believe that this is true. In a paper which I read to the British Association ten years ago, I argued that the feeling for mountains is a very old and primitive instinct. To-night we have wandered in a primitive country, and seen the way the snowy mountains are regarded by the dwellers round them. We find first, the simpler uses—the shepherd and the hunter camped by the side of the glacier; then we come to the shrine of Rekom, which has been a great place of pilgrimage from old days, where worship has been carried on to the spirit of nature; and lastly, we meet with this very curious practice of visitors from the plains coming up for glacier air, and living in the hollows of the rocks and enjoying a regular health-cure. Here then you catch primitive relations between men and mountains in an earlier stage than you get them in the Alps, where, even in the Middle Ages, there were monasteries for recluses, and bath-houses for invalids.

A great deal has been added to our knowledge to-night as to the details of this glacier group of Adai Khokh. It is a noble group; it has scenery and mountains which are quite on a parallel with any of the Alpine groups we are familiar with, and it offers a very fine field for climbers and travellers. I think we shall all agree in being anxious to pass a hearty vote of thanks to Mr. Raeburn for the trouble he has taken in preparing this paper, and the very excellent and practically final map which will accompany it when published.

SUBMARINE SLOPES.*

By Professor J. STANLEY GARDINER, F.R.S.

Off all lands there is a comparatively gentle slope which runs down to about 100 fathoms, with a steeper inclination to some depth between 200 and 400 fathoms. Beyond this the inclination becomes still smaller, passing gradually down to 2500 fathoms, or whatever is the depth of the ocean in the vicinity.

Off continents—and particularly off those continents which fringe the Atlantic ocean—this first shelf to 100 fathoms, or thereabouts, is broad, and it is usually termed the *continental shelf*. Landward of this we have the coast, and it may be a precipitous coast, or it may show an almost continuous platform from 0 to about 100 feet above the high-tide level. The latter condition is common off the North Atlantic and the North Polar sea, and the platform has been supposed to be a typical structure of general distribution; it is known as the *continental*, or *coast*, *platform* or *plain;* it need not concern us further, except that we may point out that it is neither an universal nor even a general feature around other oceans than the Atlantic, nor even on the west side of the Atlantic.

The inclination of the continental shelf varies with its breadth. If it were a mile or 1000 fathoms broad its inclination would be less than 6°; while actually off no continent is the shelf less than several miles broad, and even an inclination of 1° is rare.

Perhaps a chart of the Bay of Biscay illustrates the continental shelf as well as any. North of the Bay of Biscay it is nearly 100 miles broad, while south of the bay it is about as narrow as off any continent, being in one place only about 5 miles across; off Portugal it is also narrow. To the north it broadens round the British Isles, merging into the Wyville-Thomson ridge, which connects Scotland to the Faroes, Iceland, and Greenland. North of this line lies an enclosed sea rather than an ocean. The shelf is narrow off Norway, accompanied by deep cutting fjords;

* Royal Geographical Society, November 19, 1914.

off Greenland it is fairly broad, while off the north of America and Euro-Asia it is very broad. Through the whole of this North Atlantic region, where the continental shelf attains its maximum development, the depth of its edge is about 80 fathoms, not 100 fathoms which elsewhere is perhaps the most commonly found depth; whatever depth it may be, it almost coincides with the so-called "mud-line."

To seaward from the edge of the continental shelf is a first slope to some depth between 200 and 400 fathoms. Its angle of dip shows great

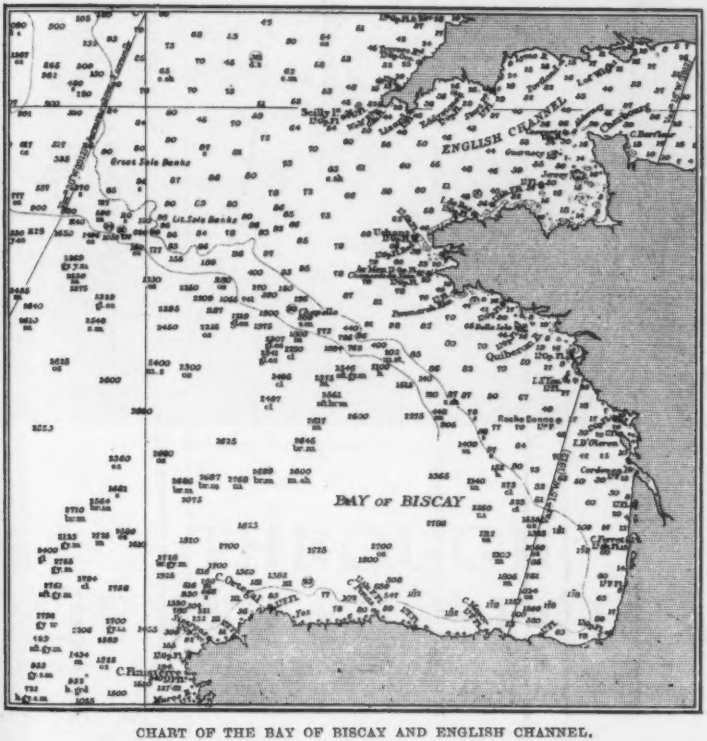


CHART OF THE BAY OF BISCAY AND ENGLISH CHANNEL.

variation, but its slope is markedly steeper everywhere than that of the continental shelf connecting it to the land. Surveyors, when at work for navigational purposes, put down a multiplicity of soundings in depths below 100 fathoms, but off coasts, when they reach this depth, at once turn towards the land. Any line of soundings outside is run as the ship is on passage to her base port and without reference to the lines of soundings inside. As the surveyor gets farther from land, accuracy is more difficult to attain, as three fixed points on the land for bearings are

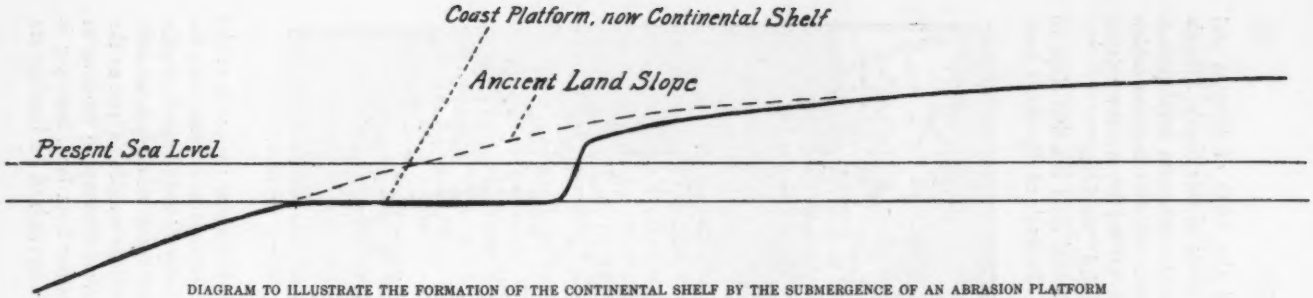
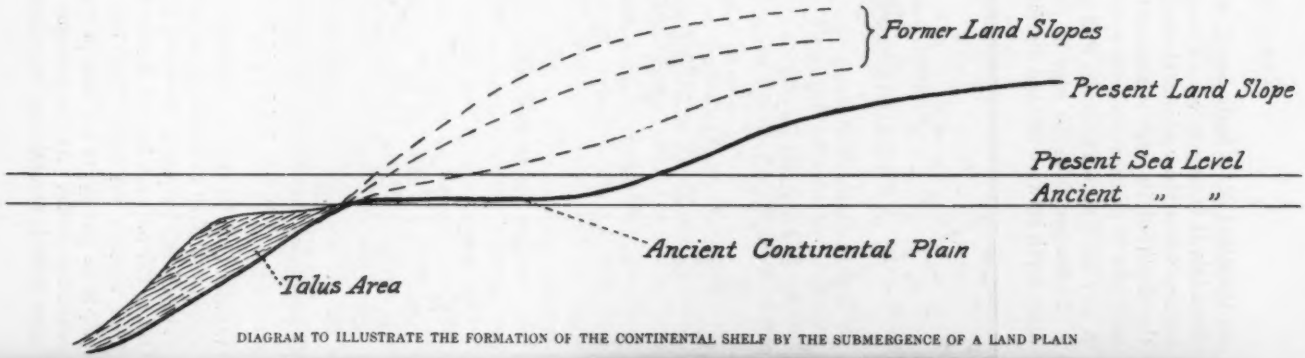


DIAGRAM TO ILLUSTRATE THE FORMATION OF THE CONTINENTAL SHELF BY THE SUBMERGENCE OF AN ABRASION PLATFORM



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THROUGH CENTRAL AFRICA FROM EAST TO WEST

SINCE Stanley first crossed the African Continent much has been done towards opening up the country from each coast—on the East by the British East Africa Company, and on the West the Congo is now a well-used highway for many, many miles into the interior. There are, however, vast tracts of intervening territory that still deservedly sustain the name of "Darkest Africa." The latest travellers to accomplish the coast-to-coast journey are the authors of this book, who made it for the primary purpose of obtaining photographic records of the animal life of the "big game" Continent. There was a "preliminary canter," as it were, in the hunting country along the Uashu Neru, and northward towards the Abyssinian border, in which the cinematograph camera was worked under extraordinary circumstances, and unique records obtained of wild life under its natural conditions. Then followed the journey across the Continent, on foot and by canoe, to the head of steamer navigation. That adventures would fall on such a journey was a foregone conclusion, but they were reckoned as incidental to the main purpose of the mission: hunting was to be done with the camera, and not with the rifle.

MR. JAMES BARNES

MR. CHERRY KEARTON
(as he appeared on his expedition)

Mr. Cherry Kearton has a world-wide reputation as the most original and daring of Nature photographers, and the illustrations in this book are unique in that never before has there been such a presentation of the country, its peoples and animal life, as is contained in this record. In some parts of the journey no photographer had ventured previously. He was successful in obtaining the first moving pictures

OLD LUPO, STANLEY'S GUIDE ON THE ARUWIMI

of lions roaring—not the tame rounded-up species, but lions in all the majesty of their natural surroundings. Other animal pictures secured were those of herds of gazelle, giraffe and mixed game drinking at water-holes; while among the unique photographs was a snapshot taken at close quarters of a rhinoceros asleep—another, that of the same beast charging.

Mr. James Barnes, Mr. Kearton's partner in the expedition, is an accomplished writer of repute, with experience as a war correspondent in South Africa and South America, and his story is told in a way that makes the book the most interesting travel volume of recent years. From the moment when the little party set out from Mombasa, until they came to the sea again at the mouth of the Congo, there were matters of interest to note with pen and camera. From Lake Albert Nyanza the route followed was that of Stanley on the historic journey undertaken for the relief of Emin Pasha in 1887, and there is much in his story that is supplemented and completed in this book.

WIFE OF THE CHIEF AT MUKANGULA

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WHAT TWO DAYS' RAIN WILL DO

seldom visible. It is accordingly difficult to determine this slope off the edge of the continental shelf with accuracy, but it is clear that 5°, or 100 fathoms in 1250 fathoms, is exceptionally steep in the North Atlantic. Such a slope of 5° is seldom exceeded even in other parts of the world off continents, except where the coasts are fringed or barred by such organic growths as are termed "coral reefs."

The further slope to the bottom varies. It is not unusual to find a platform succeeded by a marked steep for 100–300 fathoms at the bottom of this first steep, but generally continents tail off with an increasingly gradual slope to the abysmal depth, 2000 or 3000 fathoms, or whatever it may be. About 7½ per cent. of the ocean floor lies within the 100-fathoms line, while the percentage between the 100-fathoms line and the 1000-fathoms line is about the same.

To summarize we have (*a*) the continental shelf extending to 80, 100, or 120 fathoms or even deeper, succeeded by (*b*) a steep to about 300 fathoms, which may tail off to the abysmal depth, or be succeeded by one or more shelves with steeps between.

The above are well-known facts restated here by way of introduction. Continents may be assumed to be more or less permanent in a geographical sense (not geological), while, as you will see, I am mainly concerned with slopes off recent oceanic islands, the study of which may, I hope, throw light on their formation, as well as on the actions of the sea at present in progress.

I must also give, somewhat crudely for the sake of clearness, the chief theories as to how continental shelves may have been formed:—

A. An *abrasion platform* might be cut by marine denudation, possibly accompanied by slow submergence, in any case subsequently submerged. In fact, a coast platform is submerged to form the continental shelf. As an objection to this view may be mentioned the great breadth of the supposed abrasion platform as indicated by that of the continental shelf, on which waves should completely lose their forces before reaching the land. Indeed, the waves might be expected to pile up the products of abrasion against the land, thus protecting it. The formation of a continental shelf in such a manner is more easily understandable on an already dissected coast. It is conceivable, too, that a similar shelf could be formed without submergence.

B. *Submergence of a land plain.*—A land at a fixed level for a long period of time is gradually eroded towards a base level. This stage of maturity is first reached near the coast, so that a gently rising plain is formed, while there may be mountains inland. Such a plain becomes the continental shelf by submergence. To seaward there would be a distinct area of talus, and in consequence there should be a steeper slope. On this view of the formation of the continental shelf there should be no abrupt incision, but the slopes above and below the sea-level should pass gradually into one another.

These two views both imply either submergence or other change of level of the continent in respect to the sea. That there has been submergence of the land on either side of the North Atlantic is, I consider, clear, as there are numerous deep-cutting canals, submarine cañons, opposite many rivers, and deep-cut bights or straits. Some of the cañons, as those of the Congo and Adour and as many off North America, are particularly remarkable. While the central deeper parts of the English channel and of the Irish sea might conceivably be explained by scouring,

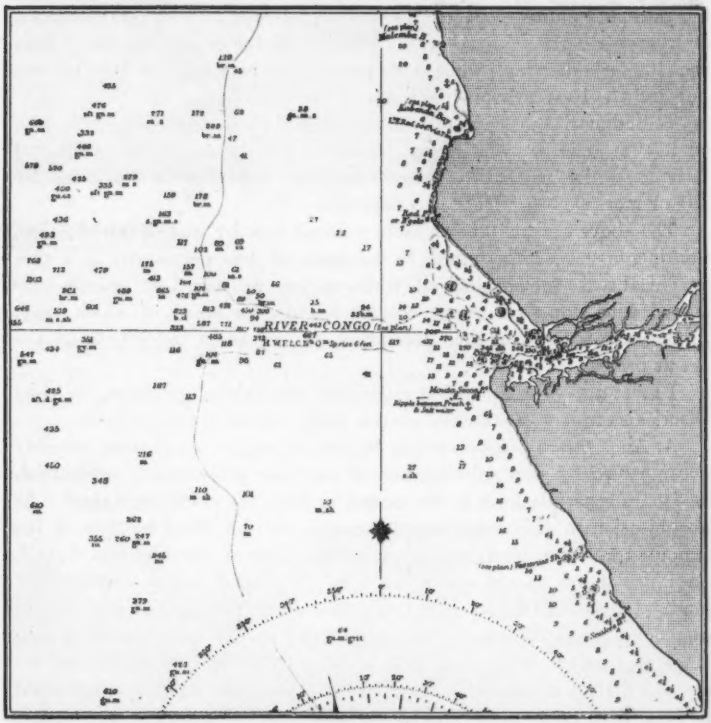

CHART OF THE CONGO CAÑON.

they can only, in the present state of our knowledge, be regarded as indicating submergence.

The submergence of 3000 to 5000 feet required in some places, such as off the Congo,* where 750 fathoms is found well within the line con-

* It is quite inconceivable that a river of fresh water flowing into heavier salt water could cut for itself a deep channel below the surface of the sea. At most it might keep open a channel which might become more marked in a partly enclosed

necting the 100-fathoms lines north and south, presents peculiar difficulties in relation to the continental shelf, for it can only be explained by a real subsidence of the whole coast-line, not by faulting. In the North Atlantic there have been, however, so many oscillations of level that it is not improbable that the continental shelf largely owes its origin to the above causes.

C. *Glacial drift.*—Material being deposited on the bottom where the ice melts along coasts of ice-covered lands, or where drifted land ice melts. The best example of this method of the formation of a continental shelf is seen in the banks of Newfoundland, where the icebergs of Davis straits get stranded and deposit their loads of rocks. To some degree such shelves are found off all lands once glaciated, being submarine terraces off their coasts.

D. *Continential shelves by sea deposits*, the terrigenous waste being deposited as near any coast as the depth and movements of the sea allow. In course of time such depositions must result in the formation of continental shelves. This method may and probably must coexist with any of the former and help to mould its submarine slope. The depth of the edge of the shelf depends on the depth to which the seas off coasts are sufficiently moved by waves, tides, and currents to transport the land waste. On the coast of an enclosed sea the edge will be at a much shallower depth than where in the open ocean waves, tides and currents may scour to great depths. By the land rocks, if split off, would be broken into pebbles, themselves to be powdered to sand. Coarse grains would gradually be ground into mud. This would be carried further and further seaward until finally the motion of the water is insufficient to move its particles. The edge of the continental shelf would correspond with the "mud line," and the slope to seaward would be expected to represent the angle at which such mud would lie. To seaward the mud should gradually merge into ooze, but actually a considerable area of hard bottom frequently intervenes.

In discussing this view, let us start by considering the vertical distribution of wind-wave movements. Trawlers are agreed that in moderate winds (3–4 on the Beaufort Scale) the bottom at 20 fathoms is churned up in the North sea, while after heavy gales much seaweed, etc., is brought up from 40–50 fathoms. Other trawler observations to

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sea by the deposition of mud on either side, even the extension of a great delta seawards (cf. Mississippi river). The forces of the waves and currents in open oceans prevent the formation of great deltas, but it is conceivable that at the sides of a channel through the continental shelf the deposition of river-carried mud might accentuate the cañon appearance of that channel; the Congo may be a case of this, but its submarine-channel was assuredly due to submergence.

It must also be remembered that submergence may be caused by subsidence, by an increase of water in an ocean, or by an increase of attraction of the water towards any shore owing to elevation of the land behind that shore, the oceans being in reality shallow basins.

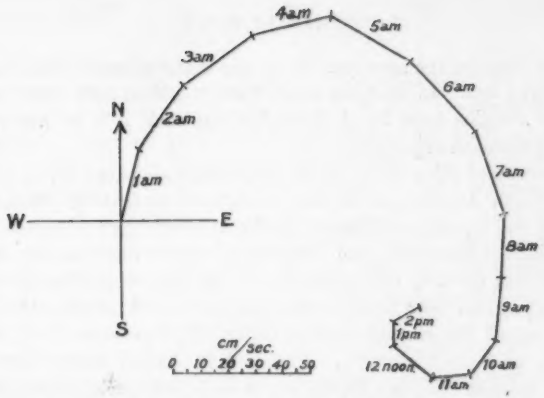
the north of these isles point to slight, but appreciable, movements to 60–100 fathoms, or even deeper, in accordance with the openness of the ocean, etc. This approaches, and indeed is in striking uniformity with, the depth of the edge of the continental shelf.*

The regular oceanic surface currents, produced by winds or other causes, may have an influence on slopes, but they do not generally extend to depths beyond about 200 fathoms. They may affect islands round which they swirl, but they generally act rather in banking backwaters against continental slopes than in directly affecting them. The banking is of course mainly a banking downwards, and the effect, for instance, of the Gulf Stream off Scotland is felt in a higher temperature continuing down to 800 fathoms, a temperature which elsewhere is found at approximately 300 fathoms. Regular undercurrents, such as the creep of the colder polar waters to the equator, are so slow that they cannot have any appreciable effects.

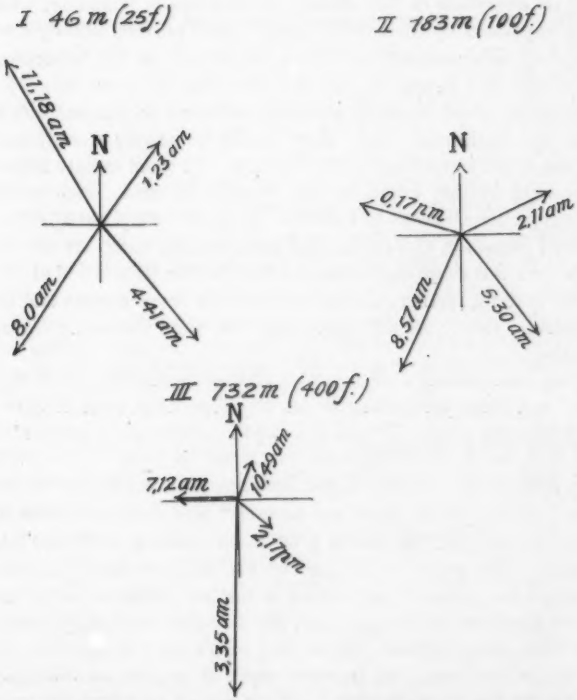
Next, we have to consider the effect of the tidal wave which, theoretically, from crest to crest is about 12,500 miles at the equator, while it actually approaches a length of 6000 miles in the great Southern ocean. Its effects are felt in the land as well as in the water, earth tides being quite appreciable and easily recognizable and measurable. In the Southern ocean the tidal wave has almost an open course round the world, being a forced wave dependent on constant external forces. In other oceans there is a free wave, generated by the above forced wave, and weakened, or reinforced, by the forced wave, which travels east to west in each. Such points require to be taken into consideration in studying the movements of the ocean at any spot, but it is essential to remember that in most parts of all oceans we are dealing with a wave in *exceedingly shallow water*, viz. in water seldom as deep as one-thousandth of its wave-length. Theory, however, may not agree with observation, and deductions from observations in experimental tanks may not apply to basins 1000 fathoms or more in depth. Indeed, caution is peculiarly requisite in applying the theory of, and observations on, waves to movements of ocean waters at different depths.

Tides on meeting an obstacle are translated into currents, as are seen in the tidal currents round our coasts. Except in very shallow water, they are not generally supposed to have any marked effects in transporting material, which might otherwise be deposited on the bottom. A current which transports material along its bed can and does abrade that bed, but it may leave heavier masses of material along its course, and the

* Direct observations could only be obtained by a vessel at anchor for a long period in one spot and in a variety of weathers. Indeed, they are almost impracticable. Records received by me from trawlers off the south-west of England point to movements at upwards of 200 fathoms, but they are difficult to analyze. They may be undercurrents, not directly due to wind waves, but owing their formation to the piling up of water against the land. Similar currents, undertows, after heavy monsoon weather were found by me off Minikoi to 120 fathoms in 1889.



THE DIRECTIONS AND RATES OF FLOW OF THE TIDAL CURRENTS AT 10 METRES FOR 14 HOURS. Sth. OF THE AZORES, 500–600 Fms.



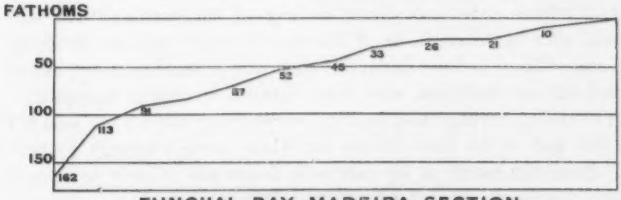
THE DIRECTIONS AND RATES OF FLOW OF THE TIDAL CURRENTS AT VARIOUS DEPTHS AT THE SAME STATION (SCALE TWICE THAT OF ABOVE.)

abrasion may for the most part be of this material rather than its underlying rocky bed. In the open ocean there is seldom such heavy material, and any abrasion must be of the underlying rock, if it be not protected by the remains of organisms.

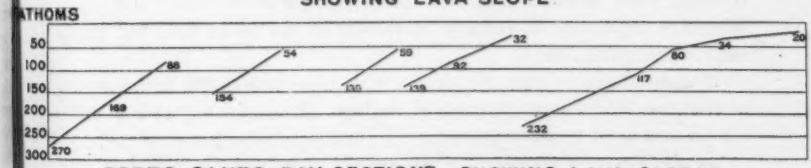
Nansen and Hjort have shown that there are many forms of motion in the North Atlantic off Norway, horizontal currents of different sorts, vortices, and vertical oscillations, produced by the play of different forces, some tidal. Buchanan and Wolfenden made observations on tidal currents over the deep submerged Dacia and Gettysburg banks. Murray and Hjort carried them much further, and introduced considerable accuracy by the use of the Ekman current meter, which measures both direction and rate of flow of currents. Anchored in shallow water, they showed that the tides at different depths set to each point of the compass in the intervals between successive high tides. In addition they made a number of observations down to 1000 fathoms, allowing for the drift of their ship. These gave indications of currents of some speed, and showed accurately that their directions of set altered at intervals in a manner which can only be explained by their being tidal. They proved, indeed, the existence of deep tidal currents, nearly to the bottom in 500 fathoms, and to 1000 fathoms in a depth of over 2500 fathoms, the rates being $\frac{1}{2}$ and $\frac{1}{4}$ mile per hour. Such currents are quite sufficient to prevent the deposition of fine sediments, and they would be *greatly strengthened* over ridges and other elevations on the bottom. To them mainly is probably due the hard bottom found on the Wyville-Thomson ridge at 200–400 fathoms from the Orkneys to Iceland. They are complicated by an arm of the Gulf Stream in this region, and even yet few observers are disposed to allow over this ridge any material effect to this translation of the tidal wave into current, further pointing out that the wave is short and moving comparatively slowly, as the forced and free tidal waves are opposed to one another.

Yet we have through all oceans numerous soundings marked "hard bottom," and these particularly lie on any elevations even if only a few hundred fathoms above the general depth. The "hard bottom" is an inferred fact, as the sounding-tube has failed to bring up a sample, has come up dented, etc., or the snapper lead has secured nothing or perhaps has been broken. Often there are several "hard bottom" soundings in the same vicinity, and the lead is a 60-lb. one moving at 50–100 fathoms per minute. For recent soundings by the modern Lucas machine we must accept the inferred fact, which is further reinforced by a limited number of dredgings, some—my own, for instance—especially made with dredges with sharp swords, set at 45° or more. Manganese nodules freely form in the ocean, and in some cases it is possible that they are responsible for the "hard bottom." Their rate of accumulation must be slow, and I have not heard any suggestion to the effect that they are more abundant on elevations than in the deeper sea around. Indeed, the

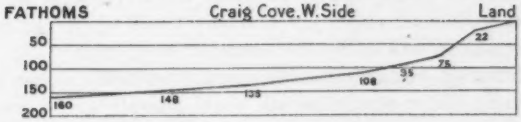
SECTION W.N.W OFF MASAMARHU ISLAND, RED SEA.

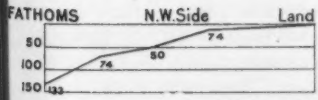


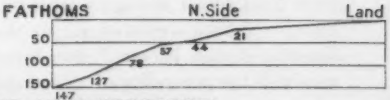
FUNCHAL BAY, MADEIRA, SECTION SHOWING LAVA SLOPE



PORTO SANTO BAY, SECTIONS SHOWING LAVA SLOPES







AMBRYM ISLAND, NEW HEBRIDES, SECTIONS SHOWING ASH SLOPES.

The section off Craig Cove is certainly that of an ash slope; the other two give no evidence of the nature of the bottom.

published suggestions are the other way, and I don't think I go too far in saying that this is generally supported by the result of dredgings. Under the circumstances, we are driven to explain these "hard bottoms" by the existence of currents. These currents, I suggest, are tidal, but the existence of specific-gravity currents, and of currents due to piling of water by winds, has to be remembered. The change in specific gravity is exceedingly slow, and any such currents would be too slow to account for a "hard bottom." Undercurrents due to wind-piling of water would not probably extend to any considerable depth. Their effect would be least in open oceans, and it is especially in open oceans where "hard bottoms" are found.

Tides, as seen in the rate of movement of the tidal wave, are greatest in open oceans, and I would ask you to bear this fact in mind in looking at the mass of sections, mostly off islands, which I have here, showing some of the most extraordinary slopes in the world. After their steepness, the prevalence of great areas between about 100 and 600 fathoms is their most striking feature. I may attempt to classify them so far as we can go :—

1. *Faulting slopes.*—A direct sinking of the earth on one side of a vertical split in the crust, as off Masamarhu island and the Brothers, both Red sea. There is fair evidence of such slopes, but less steep, having once existed off east Australia, now much masked by organic upgrowths in the form of reefs. Perhaps also faulting slopes occur also off the west of South America and in the East Indies, but there are not enough soundings to say. From the nature of the case such slopes are unlikely to have existed to any degree off oceanic islands, but it is probable that slopes similar to these have resulted from the direct upgrowth of corals and other sedentary organisms on suitable elevations of the ocean floor (cf. Dacia bank, Coral patch, etc.).

2. *Lava slopes.*—Generally convex with more or less of a cliff, varying in steepness with the constitution of the lava. Seen off many mid-Atlantic islands and in all volcanic groups.

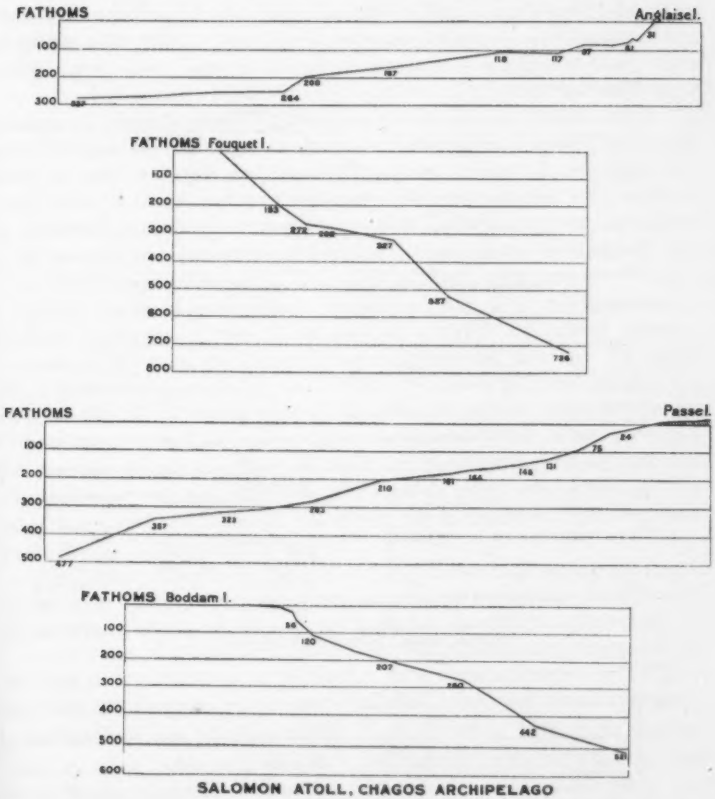
3. *Ash and mud slopes.*—The section of the bottom, more or less concave, as seen off Ambrym, New Hebrides, almost certainly represents an ash slope, while mud slopes are normally found where the continental shelf is extending seaward by the accumulation of talus.

Unfortunately, we don't know with certainty whether molten lava would split up under water, or whether ash would generally give a concave slope such as this. I confess that in these two slopes I am partially inferring from land slopes, though a large number of sections point to their existence. Off both classes of slopes there are soundings at 300–500 fathoms showing "hard bottom," but I have not got enough such soundings to establish the generality of this character.

4. *Organically-formed slopes.*—Here we have some admirable sections. All show a comparatively gradual slope to 30–50 fathoms, followed by a

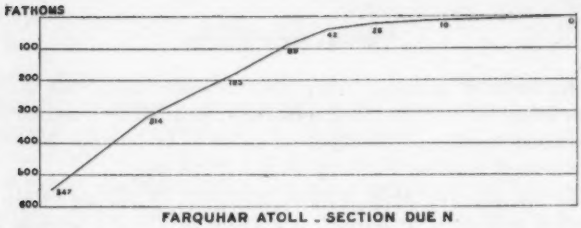
steep to 120–250 fathoms. Then there is sometimes a less inclination, almost a second shelf, to 250–400 fathoms, followed by a second steep of 100 fathoms or so; and finally a tailing off to the bottom, 2000 fathoms or whatever it may be, gradually becoming less steep.

The top slope to 30–50 fathoms is covered by growing corals, plants, and other sedentary organisms. The steep to 120–250 fathoms has also

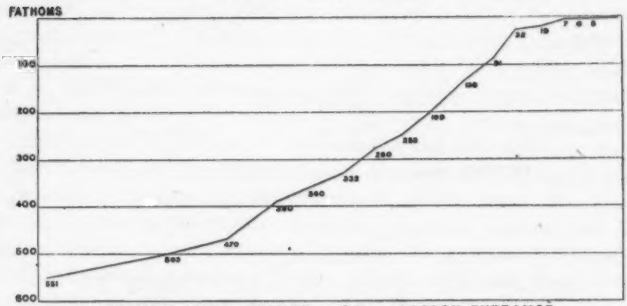


various branching growths of animals, but is mainly formed by the rough, rugged coral and other growths of the top slope; its inclination in the western Indian ocean certainly represents the angle at which this material may pile up under the sea. It is constantly by talus extending further and further seaward.*

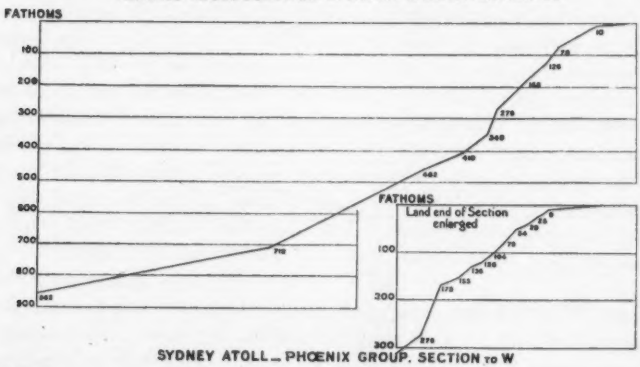
* While the continental shelf may in places be formed by talus, there are no known sections off it where comparable slopes occur in the absence of organically formed banks.



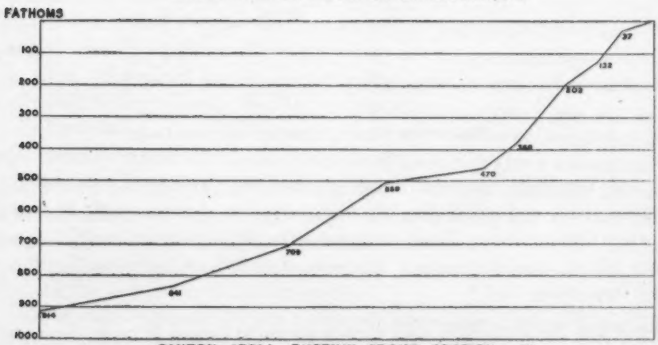
FARQUHAR ATOLL - SECTION DUE N



FANNING ATOLL - SECTION TO S.W OFF LAGOON ENTRANCE



SYDNEY ATOLL - PHOENIX GROUP. SECTION TO W



CANTON ATOLL. PHOENIX GROUP - SECTION TO W

(The horizontal and vertical scales are the same in all sections.)

The further slope may be convex or concave; that off Farquhar and off some other banks in the Indian ocean, obtained by H.M.S. *Sealark*, are convex, while the majority of slopes off coral islets in the Pacific ocean are concave. Whether these slopes are due to underlying bases of lava and ash (or mud) or other causes is at present impossible to determine.

The second shelf at 150–400 fathoms, or between these limits, shows smaller fragments of the same material as forms the above talus slope together with growing sedentary organisms in places. The second steep, and outside this to some depth, which increases with exposure of the whole bank to full oceanic conditions, but runs roughly to 600–800 fathoms, is almost all "hard bottom." * Dredging shows that it is fairly smooth. It should have over it smaller and smaller material until we get to deposits of coral mud, Pteropod and Globigerina oozes. Pieces of rock have been torn off a few times, and are mostly coral detrital material. One mass had a thin surface covering of manganese. Half a ton from one dredging from 740 fathoms was composed of land mud consolidated and covered with manganese, some in nodules. It was all polished and smooth.

The inferred fact that we are driven to is that there is some physical agency, clearly a current, extending to a depth of several hundred fathoms that sweeps the bottom clean round oceanic islands. We should be happier if we could refer such currents to known physical causes. Do I go too far in suggesting that we have in the tides a universal agency, which has moulded to a large degree the forms of the submarine slopes of oceanic islands, be they volcanic or organically formed? Round isolated land units in the deep sea, such as most oceanic islands are, they might well show maximum effects, for in the deep oceans the tidal waves reach their maximum lengths.

Probably in the present state of our knowledge I am rash, if a stronger term be not used, in suggesting the existence of submarine currents with strengths of which at present we have no conception. However, the matter is one which must be brought forward, if necessary progress in the collection of facts is to be achieved. It is extraordinary how few good sections of submarine slopes are available. Our own naval surveyors, stimulated by the late Admiral Sir W. L. Wharton, have given us some very excellent sections off islands, but off continents we have almost none of sufficient closeness of sounding to be of any value at all. May I be allowed to appeal that the oceanographer may some day, I trust in the not too distant future, after the tempest of war has rolled away, be put in

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* In charts of isolated islets the few soundings which give any record of the nature of the bottom from 50 to 500 fathoms are striking. This means that no bottom samples were obtained from which the nature of the bottom could be definitely stated. On H.M.S. *Sealark* in 1905 our records show sounding after sounding with no bottom record, though at times pieces of coral or calcareous alga were picked up.

possession of these facts, by means of which alone he can really consider the agencies which have moulded land with sea to form our present world?

The following discussion took place:—

Captain CARPENTER, R.N.: Prof. Gardiner's lecture has been most interesting to me, for I was for many years a naval surveyor, and I notice that he made use of some of my soundings. In taking a line of soundings out to 200 fathoms off a coast it is not very easy to fix positions exactly; you may easily be a little bit out, and that may make a difference in recording the proper slope.

With regard to the river Congo. I think that the shelf has been principally formed by the continued outflow of silt for generations, and that the strength of the stream has prevented any settlement of mud in the line of the flow, hence the banks have been piled up on either side of a deep trough. When sounding out the head of the Bay of Bengal I found the same sort of cañon. The waters of the rivers Ganges and Brahmaputra converge on this trough, and the soft mud in suspension is unable to settle. An interesting point was that the cold abyssal current that forms part of the circulation from the Antarctic ocean found its way up this cañon into comparatively shallow depths.

With regard to soundings taken on a current-swept shelf, it is difficult to get a true knowledge of the material of the bottom surface, for the leadsman always reports "rocky" when the lead on sounding tube brings nothing up. The only instance that occurs to me now is, that off the west coast of Southern India I found the shelf swept clean down to 100 fathoms.

On board H.M.S. *Challenger*, during her famous cruise, we frequently had an amusing argument with Prof. Wyville Thomson. When the trawl came up empty he would remark that it had not been to the bottom, whilst we, the officers who worked the trawl, maintained that there was nothing at the bottom to bring up.

One remark about the illustrations of sectional soundings in text-books. They are very deceiving owing to the necessity of exaggerating the heights or depths compared to the distances. In India, in 1889, when there was an exhibition by the Trigonometrical Survey, I thought to send them a plaster model of the Bay of Bengal which I had just sounded out. In moulding it to the real scale for distances and depths it gave practically no impression of an ocean basin, the depths appearing insignificant.

Rev. W. SPOTSWOOD GREEN: I am afraid I cannot say anything on the subject because, though I have been trawling out off the west coast of Ireland, I have not followed up the question of the lecturer to-night, who has had great opportunities. When trawling out to above 300 fathoms we come upon the edge of the slope, that sudden plunge down into the depths of the ocean. When we get beyond that slope we come to a comparatively level bottom at 1000 fathoms, and I have been trawling down to that depth. As far as my experience goes, which is only at odd times in three or four years, we got sand and mud out to about 50 to 100 miles from the shore, some places less. This was more or less of the nature of sand brought from the land, and we seldom got into any trouble with regard to the stones or rocks, but when we came to the edge of the slope and the plunge down began we lost our trawl several times; when we did get the trawl up we got polished boulders, some of them weighing a hundredweight, some so big they did not come up at all, but went through the net, and when we got beyond the slope we had the soft ooze which came up like whitewash in the trawl. The point which struck me is, so far as my experience goes off the west coast of Ireland, that the edge of that sudden dip down looks like a place that glaciers had moved out to in the old days, and dropped a kind of moraine on the edge. When we had got out as far as the sudden dip,

there seemed to have been evidence of an ice age, because the boulders look exactly like the boulders of a moraine, subangular, and unlike stones of the sea beach. These things struck me as worth following up, and I did bring home some of these large boulders, and we thought that we traced them to certain formations in Ireland. I have not thought of the subject very much, and it was of great interest to me, because when we were trawling there we had the matter often before us. With regard to the currents; I am not at all satisfied about the tidal currents causing these swirls (?) in the sea out far away from land, because I understand the tide would be a wave of elevation rather than transmission, and that that wave passing along caused currents only in narrow channels, but not so much in the open sea. Off the west coast of Ireland, where we have put down a dan buoy to lines, we were sometimes surprised to see how soon it goes under water with the tide pressure. I do not know whether the tidal current has very strong power out from the land; it might be it only goes about 100 miles off. It has struck me that it was the ocean currents, making kinds of convection currents as they move, that account for the swirls, because the Arctic water, for example, coming towards the equator, may come along in swirls and turn round the current meter in the way described, and not be the actual tidal current at all.

Dr. J. W. Evans: I should like to ask if Prof. Gardiner is aware of Mr. Mellard Reade's conclusions on the work of tidal currents in the neighbourhood of the British Islands (*Phil. Mag.*, vol. **25**, pp. 338-343, 1888; *Proc. Liverpool Geol. Soc.*, vol. **2**, pp. 50-72, 1874; *ib.*, vol. **5**, pp. 127-8, 1885). I quite agree with what Prof. Gardiner said as to the very great importance of tidal currents, but they are efficacious in shaping not only the sea bottom but also the coast-lines. When a shelf is formed by wave action on the coast it tends to protect the land from further loss, but where there are strong tidal currents sweeping along the coast, they will wear away the shelf and destroy the protection it affords to the land, and it is only where you have that conjunction of strong tidal currents and wave action that you get the very rapid destruction of the land which is characteristic of some parts of our eastern coast. The Straits of Dover, for example, are swept absolutely clear of all mud and fine sand, exactly in the way in which the author has described in other places, and I think personally there can be little doubt that the present width and depth of the straits is mainly due to tidal action. I shall be interested to see Prof. Gardiner's paper in print, and hope he will include some of the numerous illustrations he has shown us.

The President: I have wondered whether we should hear anything of the contours of the submarine mountains, and whether they at all resemble in their outlines those that meet our eyes on dry land.

Prof. Stanley Gardiner: The difficulty in laying off contours of submarine mountains lies in securing accuracy; the marine surveyor requires three fixed points, and he must either anchor beacons vertically or have fixed points on land. Many island groups form ranges of mountains, but their contours are affected as I have already indicated. Of submarine ranges perhaps the most interesting is that which Mr. Peake discovered to the east of Queensland, when he was surveying the route for the Pacific cable. It is of considerable breadth and length, but it would seem to be comparable to a plateau rather than to a range of mountains. Its outer contour lines are probably about the same distances apart as those of many mountain ranges, imagined complete before their subsequent dissection.

On isolated submarine mountains a large number of soundings have been run by Admiral Field to the north of Fiji, and by other surveyors elsewhere in the tropical waters of the Indian and Pacific oceans. Most of these mounds rise to within the 50-fathom line and are broadened out at their summits, their slopes partaking of

the same characters as those off coral reefs. To cable ships we owe the knowledge of mountains in the Atlantic, where coral reefs are absent; some appear to have almost vertical slopes around flat plateaus situated several hundred fathoms below the surface. An interesting feature of these deeply submerged mounds is that their presence is usually betrayed to the surveyor by movements in the surface waters over them. For instance, between Ceylon and Minikoi there is a small patch with depths of about 900 fathoms in an area about twice as deep. It is commonly mistaken by ships for a shallow-water area. I passed over it in 1899, in rather heavy weather, when the swirl and break of the seas exactly simulated what I would have expected over a bank 20 to 30 fathoms deep. I don't see what agency could produce these movements except tides, the possibilities of which I venture to think Mr. Green is rather inclined to minimize as well as the observations of the *Michael Sars*, which anyhow prove the existence of considerable currents at relatively great depths.

I was particularly obliged for the remarks of Captain Carpenter, for we owe so much to the *Challenger* and *Investigator*. However, the Congo must surely be considered with other cañons on the east side of the Atlantic. It is a question surely of specific gravity, the flowing out in this case of relatively hot fresh water into an open ocean of very salt cooler water. Surely there must be a rapid spreading out of the Congo waters over the sea, so rapid indeed that the undercurrent of cold salt water up its cañon should be quite considerable; indeed, I should expect it to be a case exactly comparable to the Ganges. Perhaps similar undercurrents in many submarine cañons materially assist in lessening the deposition of land detritus in their beds, while the coast platforms on either sides of them are so affected as to accentuate their cañon characteristics.

I am interested in the "moraine idea" off the Irish coast, and I searched vainly for soundings from which I could plot these slopes with some approach to accuracy. The slope may show a glacier edge, and indeed some of the stones show striæ which simulate those due to ice. What struck me particularly in Mr. Green's description was the hard bottom, which exists from the edge of the continental shelf to where the more gentle slope to the deep sea commences. I have not from charts been able to find definite evidence of such areas off continents except where faulting or recent land movements have taken place, of both of which there is no question here. The continued existence of such areas at the present day must be due to currents preventing the permanent deposition of mud and ooze.

The PRESIDENT: We are very much obliged to Prof. Gardiner for the very suggestive and careful series of observations he has laid before us. We are hardly a large enough meeting to move a formal vote of thanks, but I am certain he will realize that we have been very much interested in what he has told us.

Mr. R. E. PEAKE sends the following remarks:—

"The Continental shelf."

A very noticeable feature is the general similarity of the submarine contour, where the descent is made to the ocean bed, with that of the land of which it is a continuation. This is particularly noticeable on the south coast of Cuba, where the mountains rise almost directly from the water's edge, and where you find a depth of 1000 fathoms at less than a mile from the shore. There are many other instances that could be quoted, but the above is probably the most marked.

In the numerous examinations of coast formation that I have made for telegraphic purposes, I have only found one case of an entire absence of sloping shelf, this is at Turks island, in the West Indies. Several careful contour-lines were run on the west side of this island, and it was found that it not merely rose perpendicularly,

but in places even appeared to overhang. This may possibly come under the category of "Faulting slopes" referred to in the latter part of the paper.

"The channel off the mouth of the Congo."

Prof. Gardiner says: "It is quite inconceivable that a river of fresh water flowing into heavier salt water could cut for itself a deep channel below the surface of the sea." This is no doubt correct for almost any other river that could be mentioned, but surely not for the Congo. If you look at the enormous body of water forced through a comparatively narrow entrance it would be astonishing if it did not sweep away any soft material from its path. The fact that the cable, laid across the channel at a considerable distance from the land, was repeatedly broken, probably by the weight of *débris* carried down by the current, would seem to show that the channel has been cut and is kept clear by the river water.

"Hard bottom."

Prof. Gardiner is undoubtedly correct in saying that manganese nodules are responsible for many of the cases of "hard bottom." I found them such a nuisance in the Pacific, and had so many of the ordinary brass tubes damaged by them, that I adopted a heavy steel tube with a cutting edge; this generally sheared off the manganese, and, displacing the nodule, went on into the soft bottom. Dented tubes with manganese on them, in the Pacific at all events, are poor evidence of hard bottom, as is generally found if there is time to repeat the sounding.

"Currents in deep water."

It will be very difficult, if not impossible, to measure, by meter, currents which probably exist at great depths, say those approaching 3000 fathoms. The existence of such currents may, however, be fairly assumed if it can be shown that a difference of temperature takes place from time to time at a given spot; this direct evidence should be possible of attainment. In a paper written for the Royal Geographical Society on an Atlantic sounding expedition in 1889 it is shown that in two parallel lines of soundings, about 60 miles apart, and with an interval of about six weeks, there is a distinct difference of temperature. In the same paper two parallel lines of soundings in the Pacific, by the *Egeria* and the *Penguin*, are also quoted where there is a considerable difference of temperature; there is, however, an interval of eight years between the two sets of soundings. The above, however, is some evidence of the movement of water at these great depths—a subject which above all others deserves to be practically determined by those who have the time and means for the pursuit of oceanographical research.

BOLIVIAN EXPLORATION, 1913–1914.*

By Major P. H. FAWCETT.

Some account of the more recent explorations in which I have been engaged in South America has been requested for the *Journal*, and perhaps needs less apology in that three of the small party of four Englishmen are either at or destined for the front, including myself, and the record carries somewhat interesting information. Over certain details I must for the present draw a veil (lifted, however, for the confidential archives of the R.G.S.), because I think there is some probability of the scientific societies combining to prosecute investigations after the war, when, if I or

* Map, p. 272.

members of the party survive, some very necessary aid may be lent to such a purpose.

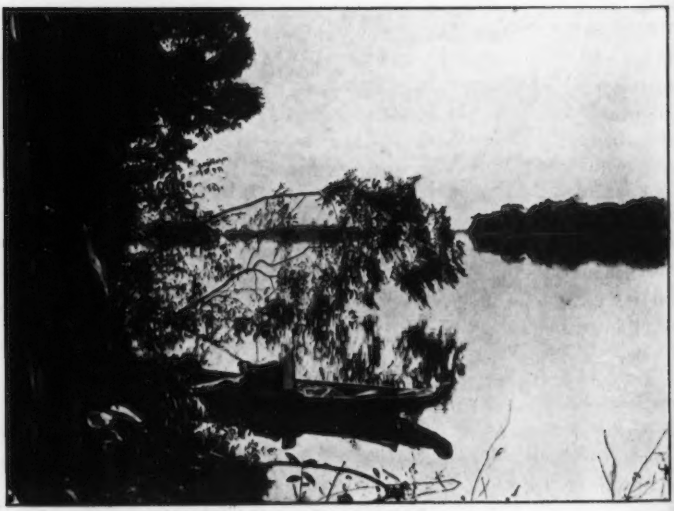
The year 1913 in Bolivia was exceptional by reason of the abnormal rainfall, which left an immense area of the country east of the Cordilleras of the Andes inundated and intransitable as late as the usually dry months of July and August—a year as disastrous to cattle ranchers as it was difficult for the freight service of the interior. Incidentally it deflected me from my original purpose, and sent me to complete an investigation of the Middle Caupolican, part of which was executed in 1910 and 1911, and which is now more completely detailed in the accompanying maps. The mountain system and rivers of this section are now fairly complete. Maps do not convey a very good idea of the difficulties inevitable in trackless forest. No part of the Caupolican can be claimed as new country, although much has not been mapped. The quinine bark hunter has pretty thoroughly traversed its hills, even as the rubber hunter has explored all navigable affluents of the Amazon and their tributaries where rubber may be suspected. It has remained for the surveyor only to put records upon paper in these places. The vexed problem of the Madidi river has been settled, however, and its source located, together with details of various minor affluents of the Beni and Tuiche. The Hundumo, shown on the maps as an affluent of the former, is nothing of the sort, but feeds a wide area of swamp lying between the two rivers.

The "Serrania" or hilly region of the Caupolican is excessively accidented, the hills being lofty, rising to between 3000 and 4000 feet from the level of the surrounding country, with sharp hog-backed ridges ending frequently in sheer precipice, making both ascent and descent a wearisome matter with heavy packs. It is chiefly noteworthy for the immense deposits of auriferous gravel, the relic of some far more extensive river system than exists to-day, lying west of the route followed by Dr. Evans in, I think, 1904 or 1905. The party experienced vicissitudes rather too startling to be pleasant, which need not, however, be referred to here. The wild Indians, Guarayos, who populate the high-lying portions of the Madidi and some of its tributaries, have been much exaggerated. A tribe of two or three hundred, which gave us rather a warm time in 1910 during the exploration of the Heath, and who have quite closed that river against Boundary Commissions or any other expedition ever since, are the only strong tribe now existing. The Madidi and its tributaries harbour only five small tribes of not a dozen souls in each, a terrible indictment against the rubber industry, chiefly responsible for their disappearance. For these people were once very numerous; Padre Armentia, the late Bishop of La Paz, himself remembering a population of some fifty thousand between Ixiamas and Covendo, whilst every "altura" or piece of land above inundation-level in the Beni province and Mojos is thick with ancient and broken pottery.

ON THE WAY TO THE SAVAGES.

GIANT CACTUS OF BOLIVIA, NEAR SANTA CRUZ.

FROM THE MOUNTAINS TO MAPIRI.



RIVER NAVIGATION.

After joining up the survey with that of 1911, already in the possession of the Society, we returned across country by the existing trail from Apolo to Rurenabaque.

The work of 1914 concerned a different region and was accompanied by very remarkable discoveries. Suffice it to say, regarding locality, that it concerns a very large area of forest country, so far as is known, unentered by any civilized man living or dead. Neither local knowledge nor history preserve any such record. The reason for this is not very far to seek. It is exceptionally difficult to reach, owing to the necessity of passing through a wide belt of low and swampy forest, in cutting through which carried food supplies are rapidly exhausted. Like all blank spaces, it had been credited with large populations of cannibal savages. Peons, or carriers, were, I may say, totally out of the question for carrying supplies. These people are not obtainable for journeys off trails and rivers. Moreover, they are unable to carry three weeks' food supplies for themselves alone, and are nervous and cowardly in the face of really bad Indians.

For journeys such as that of Colonel Roosevelt, where transport difficulties over roads and down rivers need not occur, they are useful and readily obtained, but it is always better to have white men accustomed to handle cargo animals or paddles. The man who cannot acquire these simple accomplishments and cook his own food is better left at home.

For three weeks after we said good-bye to the last outpost of what is locally known as civilization, and which the local people considered the limits of human possibility, we encountered no trace of a savage. We crossed and recrossed rivers by flimsy bridges of fallen trees to avoid entanglements of thorny undergrowth upon which "machetes" made scarcely any impression; we threaded on all fours mazes of creepers and tangled roots; we waded through swamps and fought the depression of a monotonously slow progress. Then we reached higher ground and ran up against an enormous rubber-tree showing signs of unskilled tapping—of the savages, as it turned out. Next day we struck a fine open trail. The trail led us into the middle of a large tribe, one of whose "malocas" (Portuguese for village) we most fortuitously entered at a moment when every man was out working in the plantation, and only women and children at home. Indeed, the first "savage" was a fat little kiddy, who toddled out of the small entrance of a huge communal dwelling, stone axe in hand, bent on cracking a nut.

I whistled. The child gave a screech and bolted, and the "maloca" was instantly in a tumult. We did not know, of course, that the men were away until afterwards, and had to prepare for emergency. It reads, I know, a small thing to visit these places in the security of a well-ordered country. But it is impossible to know if savages are going to be hostile or not, and the uncertainty involves exposure. One needs rather steady nerves, as a matter of fact.

These communal dwellings are very dark inside, partly because the people inside have a decided advantage in the case of attack, and partly because the ever-present and insatiable insect pest is thereby discouraged. We were therefore a very good mark outside in the brilliant sunshine for people we could not see inside, particularly as, in order to inspire confidence, we dropped our packs and sat on them. Eventually, however, I slipped into the house, to see, when my eyes grew accustomed to the darkness, only two women and a final contingent escaping by an opposite doorway. The women were engaged in brewing "chicha," or, in their own language, "averu," a sort of maize beer, and it says volumes for their pluck that they would not abandon it. Their fear, however, was pathetic. In the mean time, however, the alarm had been given, and the men would soon be back. I at once made signs for food, for we were very hungry, and received a quantity of boiled maize and a mixture of yuca, sweet potato, and monkey nuts. Probably none of us had ever tasted anything so good. We were engaged in eating when the warriors returned, surrounded the "maloca," and slipped one by one inside, arrows to bows. I went over to them and gave some small present to one or two; but what saved us from trouble was in reality the food: hospitality here, too, being the proof of amity.

We were taken subsequently from "maloca" to "maloca" over a perfect network of good trails. These "malocas" consist of one up to five communal dwellings, each of the latter measuring about 100 feet in diameter by 70 feet in height, conical in form and surmounted by a long sharp pole. The houses have a framework of wood thatched from the spire to the ground with palm leaf. Around the inside circumference live some twenty or more families, each with their own fire. Over them, around the dwelling, is a platform, about 8 feet from the ground, carrying the family share of the annual harvest. Around the thick central pole of the building are large earthenware urns used to store the "chicha." This particular tribe, whose name has been confidentially communicated, together with the record of the language, to the R.G.S., occupied apparently some fifty odd "malocas." As each house contains from fifty to one hundred souls, an estimate of three thousand souls to the tribe is not excessive. They are surrounded in the immediate vicinity by tribes whose names are duly recorded, numbering another five thousand at a reserved estimate. Within 30 miles square of us, therefore, were at least eight thousand savages, all cannibals, divided into four tribes, all at war with one another. Of those we met obviously not a man had seen a white man. Indeed, they were aware of no civilization beyond the surrounding tribes more or less akin to themselves. Our skins, clothes, arms, and equipment were objects of intense curiosity. Heralds preceded us to each "maloca," and invariably several other savages accompanied us.

The "maloca" was always entered in a rather ominous silence, all the warriors assembled, arrow to bow. The "maloca" chief received reports

from the escort and observed us carefully. Then he came over to the open space where we had been instructed to sit down, squatted down in front of me, stroked my hands, repeated the word "tabo" (welcome) several times, and ordered a woman to bring up a calabash of monkey nuts. We ate a few together, and then some of the others joined in and friendly relations were established. I don't think we stood much chance had there been any trouble. As a people these savages differ in language, customs, and appearance from any previously known. They are not tall, but are sufficiently well proportioned to carry that appearance. They have fine intelligent faces with very good features. Their colour is that of burnished copper. The people of each "maloca" have a singular family resemblance which suggests intermarriage within the "maloca." One boy had hair of a brilliant red, but the rest of the men have long, wavy black hair to the shoulders. A small horizontal tube of wood is worn through the partition of the nostrils, blocking the latter, and a thin spike, 2 or 3 inches in length, sticks upwards and outwards from the centre of the upper lip and downwards from the centre of the lower lip, something like a very waxed up-ended moustache. Bands of rubber, tinted red by the berry of the "urucu," are worn on the wrist and below the knee, and the leg below the knee is usually coloured by the same berry. The men wear necklaces of seeds, or of small perforated circular sections laboriously worked on stones out of hard black wood of the "chunta" palm, or the shell of the river mussel. The women wear the hair short and have no adornments. The lips, however, are painted black; but in spite of this some are very good looking. Feather adornment is not practised, nor is clothing of any sort worn. All smoke tobacco, which is freely grown in plantations. The brown leaf only is picked, dried over the fire, and rolled up in a strip of maize leaf to form a cigarette. It has an excellent flavour. It is varied by the use of snuff taken through a long tube with a small bowl at one end, the latter being placed in the nostril.

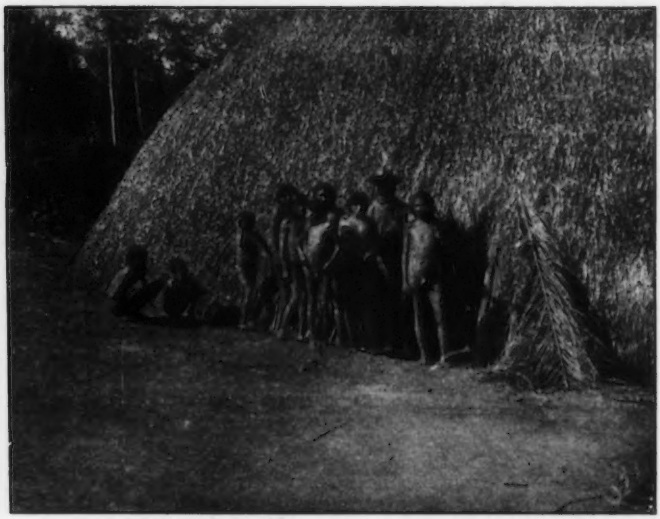
Low curved stools, cut with four legs out of solid wood with the assistance of stone axes only, are invariably employed for sitting upon, for this savage, in advance of his civilized prototype, never sits on the ground. Their bows of "chunta" palm are well fashioned and the arrows artistically finished, pointed with the sting of the sting ray, broad splinters of bamboo, or with fine "chuuta," decorated usually with barbs of large thorns. One or two of the "malocas" had blowpipes, and presumably poisoned arrows, but this arm is not commonly used. Stone axes are employed for general purposes and for felling trees. The handles are formed of vine bent around the stone and bound below it, the stone being held in place by a liberal application of the wax of the brown aggressive forest bee. The stones of these axes are brought from some distance, and the savages are very chary of parting with them, as their acquisition involves a passage through the territory of hostile tribes. Metal in any form is unknown. Knives were therefore a great curiosity.

The men sleep in hammocks made of netting of palm-fibre. Clothing of bark or any kind is unknown. Cotton is used, however, for binding arrows.

Although in this paper it is not possible to go into exhaustive details, certain remarkable points merit attention. The women are more or less on an equality with the men, relations being very affectionate. The tribe is also exceedingly musical. They have apparently no musical instruments, but sing a great deal. Every morning, about 3 a.m. or 4 a.m., one or two men of the "malocas" seated themselves outside and sang very melodiously to the rising sun. The chant was too long and complicated to record, although certain others have been noted. They are also sufficiently advanced to have perceived the difference between stars and planets, the prefix "pakari" being applied to the latter. "Pakari Newt'n," for instance, is Venus, and "Pakari Kapu" the moon. The sun is "Tajó," the "j" being the Spanish "hota." A star is "Víra-Víra," singularly suggestive of the deity "Víra-cocha" of the Incas. Records of the language were taken. Except in one or two words, it resembles nothing known. The tribe is anthropophagous, as are all the surrounding tribes, amongst whom exist a perpetual state of hostility. They had a doubtful appreciation of photography, and would not stay in the open when I talked to the stars, as I told them, with the theodolite. A flashlight picture of an interior created alarm and some suspicion. The staple food is "cumbri," or monkey-nut, cultivated in great size; but the plantations, which are extensive, produce maize, sweet potato, yuca, papaw, and a few bananas. The non-existence of bird or animal life in the surrounding forest is probably responsible for cannibalism. This particular tribe extract and bury the human entrails in earthenware urns. A neighbouring tribe eat the interior economy only, while a third tribe spit the victim on a long pole, roast him over a big fire, and while in that position pick the flesh off the body with their fingers. The latter two tribes are, however, exceedingly debased and brutal. We left this friendly tribe with regret.

Four days beyond their territory we encountered another tribe, estimated at 2000 to 3000 souls, considerably below the first one in development. These people live in shelters consisting of four poles, with a slightly slanting roof of palm-leaf. They are brutal and ugly. Their instinct is to attack strangers, and they followed it. We were saved by some luck from regrettable incidents—to ourselves—chiefly, I think, by the noisy discharge of the Mauser pistols. The brutality of savages of this kind leaves no possible measure but extinction. Various other tribes, about the same strength, inhabit the vicinity. Their utter brutality prohibited any knowledge of their customs or their language, which, however, is again quite distinct. The full area of this unknown region must contain at least a hundred thousand savages. They show neither sign of degeneration physically nor trace of the Mongol, which peculiarity is,

SAVAGES WHO HAD NEVER SEEN A WHITE CIVILIZED MAN.



A HUT OF THE NEW SAVAGES.

A MALOCA OF THE SAVAGES.

however, confined to the Indians of the Andean plateau and parts of the Caupolican and South-East Peru.

Our journey took us some distance beyond the tribes mentioned, from whose neighbourhood we discreetly withdrew. We reached, indeed, what appeared to be the proximity of another tribe, when sickness forced upon the expedition a premature return. One of my companions, Mr. Costin, narrowly escaped collapse, and the remaining two were much too ill to warrant advance. A heavy pack of over sixty pounds, perpetual insect attacks, all-day journeys, forest cutting, short food supplies, and constant alarms produce a severe nervous strain upon the greatest endurance. It is probably impossible to exactly describe what such conditions mean. They must be experienced. A single day's journey with such a pack through swamp with a few inches of mud, or cutting through the intricate mass of creepers and thorny undergrowth which makes bad forest, may be all right for the leader, who is more powerfully armed with enthusiasm, but it is killing for the rest of the party. Add other disabilities and it needs very exceptional men. The average British soldier is more than satisfied to occasionally carry a fifteen-pound pack over good roads! Rain, too, is disheartening, and there is plenty of it. In order not to court undue risk we were forced to make a wide sweep around the territory of the hostile tribes, now converted by self-defence measures into nests of angry hornets. Nor was it certain that we should avoid them or other tribes of a similar character. Fortune, however, favoured us. It is interesting to note the possibilities of forest navigation, for counting 2200 paces to the mile, and basing courses upon astronomical observation, we arrived at the original "maloca" with an error of 300 paces only, after a journey of about thirty leagues.

We returned at a most opportune moment. The two chiefs and (I suppose) the priest of the first "maloca" were sitting on their stools just inside the principal entrance totally oblivious of our presence, their eyes glassy. At intervals they made upward passes over their stomachs and were violently sick. To tell the truth, I fancied at first that there had been some drunken debauch. However, they suddenly came to and viewed us with amazement. They had been auto-hypnotized. We had struck the "maloca" during the ceremonies attending a death. A scrap, it appeared, had taken place with the second tribe we had met, resulting in the wounding and subsequent death of one of the tribe. He had been roasted over a big fire outside the "maloca," his entrails had been placed in an urn, closed by leaves, and tied up for burial, and the body had been cut up and divided amongst the various families. The ceremonies were designed to rid the "maloca" of the spook, which the chief informed me would return for three days to the scene of its former endeavours. The hypnotic ceremony and vomiting were repeated at intervals. The vomiting I could only surmise as having something to do with the "influence" consumed in the banquet. Subsequently a small screen of

plaited palm-leaf was erected inside the "maloca" in such a way that the light from the entrance fell full upon it. Opposite to it squatted on their stools the two chiefs and the priest. At the foot of the screen was placed a calabash of water with a few herbs.

The priest in the middle worked his hands in front of the screen so as to throw shadows upon it. This shadow was carefully studied and discussed. Every few minutes the three of them would apparently squeeze some "influence" from arms to finger-tips, legs to toes, head to ears, and so forth, gather it in the hand and throw it at the screen. This procedure continued until something in the shadow satisfied them. In the mean time all the women chanted in unison a weird and monotonous dirge. The ceremony was remarkable, indeed impressive. For three nights the two chiefs and the priest sat on their stools in the moonlight outside from sunset to dawn singing a melodious and infinitely pathetic chant, the last words of which were "tawi takni—tawi takni—tawi takni," in solo successively and then in harmony together. After the third night the spook was assumed to have hied itself to the far bourne.

This ceremony is known as "tapi." In another "maloca" the same ceremony was in progress, though here the victim had died apparently a natural death. Anyway, he was, as they said, "chimbibi koko," which means "food for the pot." In spite of large deputations of warriors with requests to visit their "malocas," I had to put a limit upon our stay. My small stock of gifts had run out and we were suffering from the repletion engendered by too abundant a food supply. Having loaded ourselves with ten pounds of monkey-nuts each and exchanged everything available for bows and arrows, stone axes, and necklaces, we left these interesting folk for the long tramp through low bad forest back to civilization.

On the way we fell in with a troop of "marimonos," the large black prehensile monkey, which augmented the larder. These monkeys, everywhere esteemed a great delicacy, rather upset us. The buoyancy of a vegetarian diet was, I remember, replaced by a sense of extreme lassitude after an abundance of meat. It is not improbable that monkeys are deleterious after being subjected, as these were, to the fright of a long chase. In these forests, by the way, exists an unusually large variety of the black howler, apparently unknown. Owing to the restriction of naturalists to the more accessible parts of the forest, I venture to suggest that much accepted data regarding the fauna of the interior requires modification or addition.

There are certainly species of the smaller animals which so far have not been recorded in the text-books—the "mitla," for example, a black mixture of dog and cat. Some of the monkey family have not yet been identified. There are, too, six distinct species of the cat family—the jaguar, the black panther, large puma, small puma, the "tigrecillo" or large cat, marked like a jaguar, and the "gato mielero" or honeysucker, variously

marked, rather smaller than the "tigrecillo," and hunting in troops of six to twelve. A wild dog, more like a wolf, and quite distinct from the fox, is not uncommon.

The giant armadillo, the great river tortoise, or "tartaruga," and the skunk are better known, but they are very rarely seen by travellers. Humboldt makes curious errors in the habits of the howler monkey, and Bates seems to have considered monkey-eating extraordinary, whereas it is esteemed a delicacy everywhere. It is a very necessary item of diet, for it is easy enough to starve. Edible palms or plants are not to be found everywhere, nor are fish always to be caught in the rivers, as some travellers imagine.

After three weeks of forest navigation we recovered our canoe, and had about twelve days of hard paddling before we reached a civilized trail. A fortnight later we heard rumours of the war, walked 500 miles, with very sore feet, to a point where transport was obtainable, and, subjected to many delays, returned home to take our part.

A thorough exploration of the region and tribes I have indicated is very desirable. It is risky, and, as such, attractive. It should, I think, be realized that ethnologists, boundary commissions, and river expeditions, albeit doing admirable work, are not "exploring." An extraordinary number of small tribes are scattered about on or in reach of the lesser navigable rivers, but almost without exception these are known to and have some sort of friendly intercourse with the rubber pickers. They are, however, being "discovered" again every year. The very retired forest sanctuary is not open to river expeditions; it is practically impossible for collectors; it has no rubber attractions; and here the large populations of savages still existent hold undisputed possession. I doubt if there is a single really wild savage, ignorant of the white man, within three weeks' journey on foot from a navigable river. To visit these people needs nerve and experience.

For these journeys, for all journeys, one might say, of "exploration" the refinements of surveying are impossible. Large instruments and wireless equipment are unthinkable. Any one who suggests such things has no knowledge of what the forest is. A large party invites disaster, because it is too great a tax upon the food supplies of the wild people and too easily victim to starvation, whilst a small party runs proportionate risks and is too easily destroyed. Experience alone can limit the risk. Insect pests are much exaggerated by "tenderfeet." Fortunately, numerous as they are, they are restrained by seasons and localities.

Diseases are more or less confined to civilized places, nor are fevers acquired in unexplored forest. Wild Indians need not necessarily be met with. A German living for thirty years within a few leagues of extensive tribes of savages has never yet seen one! I remember that a certain American traveller and writer of books doubted the existence of jaguars and savages because on his travels he had seen neither!

It is a curious continent of apparent contradictions. Any one can traverse the continent east to west or north to south by the recognized trade routes, with some discomfort, perhaps, but with no great risk. Yet within 15 leagues of Sta Cruz, the capital of a province, and close to a main trail, are hostile savages in the stone age, who necessitate half a dozen small garrisons for the protection of the traveller. Within 3 leagues of the much-navigated upper Mamore, on the Lake of Cusi, is a tribe of over (reputed) a thousand hostile Indians, quite unapproachable. The right bank of the lower Mamore, near the confluence of the Itenes, is closed by savages to all but a large force. The river Heath, an international boundary river, successfully defied the entry of boundary commissions. The Parecis Indians near Matto Grosso city may be entered with impunity by the white man, but are deadly enemies of the negro. They, however, are renegades from civilization. The populations of the Northern Chaco are little known, and difficult to visit.

Brutality has alienated some of the tribes. Only lately the "kultur" of a Peruvian official in the Madre de Dios inspired him to wipe out the harmless and amiable "chunchus" of the middle Tambopata. We who knew them regret it deeply. A curious bearded tribe in the river S. Martin in East Bolivia resented ill treatment by burning the rubber trees and disappearing, no one knows where. Many of these tribes, it is true, are intractable, hopelessly brutal, but others, like our friends of 1914, are brave and intelligent, deserving much consideration.

In closing I gladly acknowledge the services of my companions. Mr. Costin, who accompanied me four years, is at the front with the Rifle Brigade; Mr. H. Manley, who accompanied me two years, has enlisted; and Mr. Brown elected to remain in South America. That they formed so small a party is a recommendation of their worth.

DR. F. DE FILIPPI'S ASIATIC EXPEDITION.

FOURTH REPORT.

EARLY in September, 1914, the expedition left the Suget station in the valley of the Kara Kash, to the north of the Karakoram, to cross the Kug Art pass (16,160 feet) into the upper Yarkand or Raskem Daria valley. On reaching the river at Kirghiz Jangal we again divided into two parties. Major Wood went up the valley to join at Kufelang Mr. Spranger and Petigax, with whom he proceeded to explore the two western tributaries which they had seen in the preceding month.

Dr. De Filippi, Prof. Abetti, and Marchese Ginori went down-stream with the intention of reaching the Oprang by crossing the Aghil pass.

The hope that the bad weather experienced in the summer would

cease with the autumn was not realized. Every day fresh snow fell on the mountains, with rain in the valleys. The moist atmosphere hid the view of the peaks and ranges, rendering the topographical work most difficult. The most serious consequence of this persistent bad weather was that the summer floods did not decrease, as we had expected. On this fact we were counting, as the road follows the river-bed, and it is impossible to travel in these valleys when there is much water in the rivers.

During the two first days after leaving Kirghiz Jangal we were obliged to ford the Yarkand river eight times, but this was only possible in those parts of the valley where the river flowed in several channels; further on the valley, closing in, became a long gorge, and as the river flowed in one deep stream we were obliged to keep to the higher ground. With much difficulty we succeeded in passing over spurs on the right side of the valley, and six days from the time we had left Kirghiz Jangal we descended one of these more precipitous than usual, opposite the valley by which we were to ascend to the Aghil pass. But in front of us ran the swollen river, turbid, swift, and full of whirlpools. After wasting a whole day in vain efforts, we came to the conclusion that it was hopeless to get the caravan across. Some of the strongest horses managed to swim to the other shore, but the camels were carried away by the current. On account of this, to our great regret, we were compelled to give up the proposed exploration of the Oprang valley.

In the meantime Major Wood's party explored in succession the western tributaries of the Yarkand, mentioned above. Contrary to our surmises, these did not rise on the northern slopes of the Karakoram, but from a snow-bound chain to the north of it, which probably separates the basin of the upper Yarkand from that of the Oprang. When the map is drawn, we perhaps shall be able to judge what relation this chain has with the Aghil and the Karakoram.

In the northern of these tributary valleys, 5 miles above its junction with the Yarkand, the party found the deserted baggage of a previous traveller, including some copies of the Koran and a few letters. This valley is so narrow and gorge-like that for the entire length of it you have to travel in the stream-bed full of water, and it seems impossible, therefore, that it should ever have been used as a regular road of communication. Still, this discovery seems to tally with the tradition of a short cut between Kufelang and the Nubra valley, of which many ancient explorers make mention (G. W. Hayward, etc.), but which no one has verified up to the present. With the aid of the letters found by us, we are now having inquiries made at Yarkand and Kashgar, in the hope of gaining further information.

From the Yarkand river (Raskem Daria) both topographical parties crossed the western Kuen Lun by different passes leading to Kargalik and Yarkand.

From September 27 to October 10 our gravimetrical and magnetic observations were made at Yarkand. Here we received quite clearly the longitude time signals by wireless telegraphy from Lahore. On October 15 we reached Kashgar, and were received with European hospitality by the English and Russian consuls. We remained there eleven days to finish our geo-physical work. By means of the wireless apparatus we were able to obtain with great exactness the longitude of Yarkand and of Kashgar, two important stations which have served as base for all previous topographical work in Chinese Turkestan.

On October 27 we left Kashgar for the last caravan stage of our journey. In eleven days we crossed the mountainous region between Chinese and Russian Turkestan, finding the highest pass (Terek Dawan) already covered with the first autumn snow. At Andijan we reached the railroad after a journey lasting fourteen months.

In the observatory of Tashkent was made the last of the series of gravimetrical stations which had begun at Dehra Dun, and thus the Indian system was connected with that of Asiatic Russia.

The Tashkent Military Topographical Institute kindly consented to take charge of the scientific equipment of the expedition, and to keep it for us until normal means of communication—at present interrupted on account of the war—have been re-established. The expedition has brought back to Italy with it only the chronometers, the photographic lenses, the gravimetric instruments, all the scientific and topographic records as well as the exposed photographic plates.

Commander Alessio and Prof. Abetti are now busy making gravimetric observations at the Hydrographical Institute of the Royal Navy, Genoa, with the same instrument that was used during the expedition. This station was the starting-point of all our observations. Thus the whole of the system of stations in India, Central Asia, and Asiatic Russia will be united to a fundamental station of the European system.

General Outline of the Work of the Expedition.

The expedition was able to complete the whole of its programme in sixteen months and a half.

In the domain of geophysics, the gravimetrical survey (made by the Survey of India) in the plains of Hindustan has been joined to that of Russian Turkestan (made by the Military Geodetic Institute) by means of a chain of stations across the mountainous regions between Northern India and Central Asia, and through Chinese Turkestan. In addition the complete system has been connected with the European Gravimetrical Survey through the fundamental station of Genoa.

Fourteen stations were made, and in spite of the difficulties met with on account of the exceptional conditions under which we had to make our observations, they were carried out by the most precise scientific methods. Eight pendulums were always observed. The gravimetric

apparatus was always used without support, and usually rested on a large rock embedded in the ground, and with this method we obtained very small variations in the value of the flexion. Where buildings were lacking, a large tent specially constructed was used, in which temperature variations could be maintained within the necessary limits. The geographical co-ordinates of each station were rigorously determined, and topographical data of the neighbourhood were collected, with addition of photographic views and panoramas. The expedition was provided with chronometers and astronomical instruments.

On account of the peculiar features of the regions crossed by the expedition, the analysis of the results should lead to interesting conclusions on the influence that mountain masses, altitude, etc., exercise on the value of gravity. The stations were made at heights varying from 5000 to 17,000 feet above sea-level.

At all stations observations were also made to determine magnetic inclination, declination, and force—and at Skardu, taking advantage of the length of our sojourn, the daily magnetic variation was studied.

Wherever the expedition stopped to make geophysical observations, regular meteorological data were collected and pilot-balloons sent off, and, weather permitting, observations of solar radiation were made by means of various pyrheliometers. Particularly remarkable in this respect is the station of Skardu, which was open during four months of the winter 1913–14, and the one on the Depsang plateau at an altitude 17,500 feet, where uninterrupted observations were made for two and a half months.

In collaboration with us, pilot-balloons were sent up from various stations of the Indian Meteorological Department at similar hours, and it is hoped that these observations may lead to some conclusions concerning the circulation of the winds, more especially in regard to the monsoon.

Without the aid of maps and illustrations it is difficult or impossible to describe the geographical work, therefore I limit myself to a few short observations. The Eastern extremity of the chain of the Karakoram mountains was, previous to this expedition, very slightly known. About 1865, a topographer of the Indian Survey, Mr. Johnson, had made surveys of the caravan routes between Ladakh and Central Asia. He had seen the front of a glacier, from which rises the Shyok, one of the principal tributaries of the Indus, and had given it the name of Remo. But he had been unable to show either its extension or the direction and the position of the valleys through which it flows. Nor was he able to ascertain the position of the watershed. The exploration of this glacier and of the neighbouring portion of the Karakoram was the work that the Expedition accomplished last summer. The Remo is a glacier of unexpected size and importance. Its area is more than 300 square miles in extent and is formed by three large rivers of ice, each about 20 miles in length and 3 to 5 miles wide. The glacier has many peculiar

characteristics, and its basin is, as it were, a transition between valley and plateau. This is only an instance of a more or less general phenomenon which we found prevalent in our explorations of the region. The most interesting fact, undoubtedly, is that from the Remo rises the river Shyok, a tributary of the Indus, discharging its water into the Indian Ocean, and also the Yarkand, one of the large rivers that loses itself in the sands of Central Asia.

The discovery of the source of the river Yarkand led later to a systematic exploration of all its upper basin. This work was much hampered by persistent bad weather. Nevertheless, thanks to the sustained efforts of all, it was possible to triangulate and survey about 5000 square miles of country.

Particularly interesting was the determination of the differences of longitude by means of time signals sent by wireless telegraphy from the wireless station at Lahore, and received simultaneously at the headquarters of the Trigonometrical Survey of India at Dehra Dun, and by us at our various stations. Before and after the transmission local time was determined by star observation. Thus, the difference of longitude could be calculated very exactly, and so it will be possible to show—with the help of the latitudes—the deviation of the plumb-line at all our stations situated in the valley of the Indus, and on the Depsang plateau. Also exact co-ordinates of the Karakoram and Central Asia stations have been obtained, and this should be of the greatest use to correct the old maps, and for all future topographical work in the region.

The vast mountainous zone situated between Western India and Central Asia did not interfere with the transmission of signals, which were always received quite clearly, even in the distant stations of Yarkand and Kashgar.

I have still to mention the geological researches. These covered a much vaster area than that included in the itinerary of the expedition, viz.—a large portion of Baltistan and of Ladakh, some of the high plateaux of Western Tibet, and the Eastern extremity of the Karakoram. A large quantity of fossils was collected, which will make it possible to assign a date to the formations crossed by us; the extension and the limit of the past periods of glacial age were also especially studied. It is hoped that with the material collected it will be possible to form some sort of a rational classification of this complicated system of mountains based on their geological composition.

Prof. Dainelli, in his numerous geological excursions, also collected abundant material for the study of the anthropo-geography of Baltistan and of Ladakh. Up to the present time this has not been systematically studied, and so many contradictory assertions regarding the races that inhabit these regions have been circulated.

In addition, the expedition has brought back abundant illustrative matter referring to all the fields of its activity.

(Rome, December 15, 1914.)

THE HOUR-GLASS OF INDIA.

By Major C. H. BUCK, I.A., Punjab Commission.

In these strenuous days of war it is almost a relief to carry the mind occasionally to distant lands and former times. This is my apology for writing the following lines.

The momentous decision to remove the capital of India to Delhi, as announced at the great *darbar* held there in 1911, has been acted upon, and a new city, which promises to be the proudest and grandest of them all, is now being constructed on a site stretching along the west of the line of its seven predecessors. The tract in the vicinity of Delhi—that city of many names—has always held an important place in history. To grasp this fact, we must convey our thoughts to those past ages when the mysterious Aryans first entered India; when the remarkable Hindu and Buddhist religions—which now influence hundreds of millions—were moulded into shape; when the great Alexander, with his generals and forces, marched across mountains, plains, and rivers in that expedition, the longest and most hazardous ever undertaken by man; when the Scythian hordes from Central Asia swept through the Hindu Kush and made inroads into India; when the Mohammedan conquest set steadily towards that country from its north-western border, where the waves of invasion have so often broken.

Surely no other similar-sized tract in the world has witnessed such a series of soul-stirring scenes as that narrow strip of land which lies immediately to the north of Delhi. Here, from time immemorial, invaders—intent on acquiring territory, on exploration, or on gathering loot—have arrived in legions from the north-west; here rulers, for the time being, of India have assembled their forces to resist the intruders. It is indeed unfortunate that ancient India possessed no historians to give to posterity trustworthy accounts of the numerous wonderful events which must have occurred in this interesting quarter of the world prior to the advent of Alexander.

The first ray of light thrown on the history of India is contained in that celebrated series of poems the *Rig Veda*, which forms part of the great literary memorial of the early Aryan settlements in the land, and which tends to show that between 3000 and 1400 B.C. the Aryans advanced from the banks of the Indus, drove back the aborigines from the Punjab, formed colonies there, and secured possession of the stretch of country between the Thar desert and the river Jumna. The *Mahabharata*, another great collection of Indian legends in verse, some of them, perhaps, as old as the Vedic hymns, also enlightens us to some extent. Its main story deals with a period not later than 1200 B.C., and narrates a struggle between two families of the ruling lunar race. The sites of the battles and the scenes of the numerous dramas are described in its poems

as lying in the tract north of Delhi, a tract which has become the "holy land" of the Hindus, and to which they continually make pilgrimages.

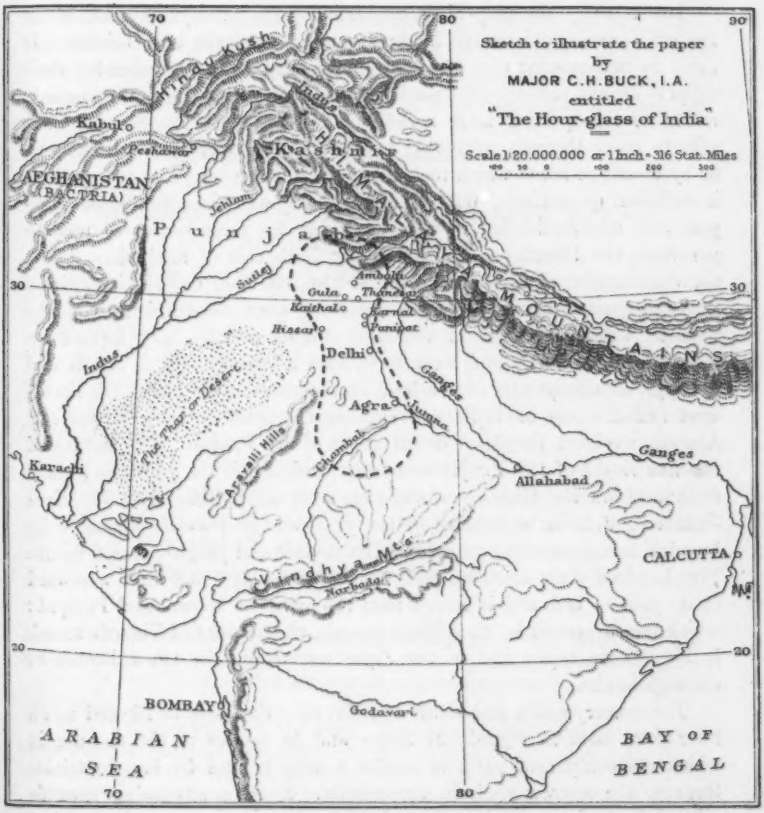
The first recorded attempt by a foreigner to conquer India was that made by the proud and ambitious queen Semiramis, who, after obtaining possession of Bactria, spent three years in preparing for the passage of the mighty Indus, only to be driven back with severe loss directly she had crossed it. Darius, who was more successful, managed to bring a large portion of the Punjab under his sway, but had to give way to the advance of Alexander the Great in 327 B.C. It is only from this date that any trustworthy record and that a somewhat scanty one—of the history of India has been made, while it was subsequent to Alexander's expedition that the geography of this much-sought-after land first began to assume a regular and systematic form. The history of the past two thousand years, however, teems with accounts of the taking and retaking of Indraprastha, or Delhi, as it afterwards came to be termed; of the marching and countermarching through the region immediately to its north; of the great battles fought at Panipat, Karnal, Taraori, and Thanesar.

After Alexander's retreat, Seleukoe, the Græco-Bactrian ruler, was the next to attempt an entry into Central India, but he was defeated (probably north of Indraprastha) by Chandra Gupta, the grandfather of the great king Asoka, and forced to return to Bactria in ignominy. Thereafter India remained in possession of Buddhist or Hindu rulers until 1192, when Mahomed, an Afghan of Ghazni, defeated Prithwi Raj, the last Hindu king of Delhi, at Taraori in an engagement which proved decisive. In the following year Kutb-ud-din, Mahomed's slave general, captured Delhi, and, on his master's death in 1206, appointed it the capital of what has been termed the "Slave" dynasty. His memory has been perpetuated by the noble mosque which bears his name, and by that world-famed monumental tower, the Kutb Minar, which rises alongside it to a height of 238 feet.

The Slave dynasty ruled for almost a century, and thereafter Delhi was the scene of continuous changes; the enormous hordes of Timur poured through the Punjab from the north-west and sacked the city in 1398; over a century later Babar from Samarkand defeated Ibrahim, the last of the Lodi branch, in a great battle at Panipat; Sher Shah, an Afghan governor of Bengal, attacked Hamayun from the east and drove him from Delhi in 1540, but his successor was ousted a few years later by the Moghals, under Akbar, after another desperate encounter at the same place; in 1737 the Marattas from the south-west commenced to oppose the Moghals, and two years later Nadir Shah, from far-off Persia, effected a triumphant entry into the city and carried off an enormous quantity of plunder, including the celebrated peacock throne of fabulous value.

During the eighteenth century, Delhi became the alternate prey of Afghans and Marattas, between whom, in 1761, a savage battle was fought on a plain 3 miles north-east of the town of Panipat, where four mounds,

covering a front of about 1¼ miles, are pointed out still by the villagers as being the gun emplacements of the Afghans. In 1803 the British, under Lord Lake, appeared at Delhi and vanquished the Marattas; they then took the emperor Shah Alam, who had been a prisoner in the hands of Sindhia, under their protection, and established themselves in the neighbourhood of Delhi. Excepting the Mutiny, the final wars of the British



in India were those with the Marattas in 1818, and with the Sikhs of the Punjab during a few years preceding 1849, when the frontier was advanced from Karnal, where it had been since the beginning of the nineteenth century, and where Ochterlony had been agent to the Governor-General. It was then that the Punjab was annexed.

Through all these ages the immediate vicinity of Delhi has been the point to which the forces of all invaders have converged; whether it

were the Aryans, Græco-Bactrians, Scythians, Mongols, or Mohammedans from the north and north-west, the Marattas or the British from the south-west and east; one and all focussed on Delhi. It is, therefore, evident that there must always have been some very strong geographical reasons for this long sequence of similarity, and for the fact that from remote times one great city after another has been erected near the site of the present city of Delhi.

Let us study the map of India, omitting its railways and canals, its modern towns and irrigated lands, its metalled roads and bridges. It must be remembered that the armies of former days depended for their supplies on the country they passed through, and that there were no safe means of transporting large invading forces by sea. Troops were only able to move through cultivated lands; to cross rivers by fording them, or by means of boats which took many months or even years to construct in sufficient quantities. Without a thoroughly organized system of transport and communication it was impossible for large bodies of men to penetrate the Himalayas at any point in India east of Kashmir. Before the construction of railways by the British, the Thar desert—including a fringe of sparsely cultivated land—stretching from the Arabian sea on the west to within 20 miles of the river Jumna on the east, formed an impenetrable barrier; and, even now, with a vast system of canals and railways, all except one of the land communications between the north-west and the rest of India converge on the tract between Hissar and Ambala, avoiding the great desert south of the Punjab. The Indus and the five rivers of the Punjab were only fordable in the plains at a short distance from the Himalayas, and then with much difficulty; the river Jumna itself, at most seasons of the year, was uncrossable owing to its breadth, its marshes and quicksands, its ravines and jungle-covered banks. Five hundred years ago the course of the Jumna lay 7 or 8 miles westward of its present bed, and it flowed near the towns of Karnal and Panipat; which fact is proved by the village records, the account of Timur's march in his autobiography, and in the *Zafar namah* and by the existence of old high banks.

The country north and south of Delhi may therefore be likened to an hour-glass, both as regards its shape and in respect to the manner in which the component parts of armies passing to and fro had to trickle through the narrow neck in the middle. A force advancing towards central India from the direction of Afghanistan had necessarily to pass by Thanesar, Taraori, and Karnal, or by Guhla and Kaithal to Panipat in order to reach Delhi. No commander would ever have risked attempting the passage of the Jumna for fear lest his army be attacked in rear or in flank from the direction of Delhi before it had effected a crossing, and, indeed, he would have gained no advantage by entering the tract between the Ganges and the Jumna before gaining possession of Delhi. Similarly, any force proceeding from Hindustan towards the north-west,

either to invade the Punjab or to meet an attack from that point, had perforce to utilize the neck of the hour-glass.

It is thus apparent why all the great battles, which so often decided the fate of India, were fought at or in the neighbourhood of Panipat, the outpost of Delhi, and the sole gateway through which an outsider could obtain an entry into India proper; it is also explained why the capital of almost every empire ruling India was situated at Delhi, where it could guard the key to its domains. The British, by means of canals and railways, so widened the neck during the last century that the hour-glass is not now so apparent, but Delhi has again become the capital, and thus impresses upon us her former geographical importance and her historical fame.

SPITSBERGEN: NOTES TO ACCOMPANY MAP.*

By GUNNAR ISACHSEN.

THE map is compiled from the following sources: For the stretch of coast from Loweness to Grey Hoek, Isachsen's map on the scale of 1:200,000 (in the press). In this map is included the Isachsen Mission map, on 1:100,000, from 1906 and 1907,† and a few details from Bruce's map of Prince Charles foreland, 1909, and from Staxrud-Hoel's map of the coast south of Cape Linné, 1913 (not yet published). The stretch of coast from Verlegen Hoek along Hinlopen strait, and southward along Stor-fjord to South cape, to and including Horn sound, as well as the west side of North-East Land, is taken from De Geer's map of 1900.‡ King Karl Land§ and Hvitöy island‖ are taken from Nathorst, as also the map of Bear island,¶ van Mijen bay,** Recherche, and van Keulen bays.†† The map of the coast between Horn sound and Bell sound, the

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* Map, p. 272.

† 'Résultats des campagnes scientifiques accomplies . . . par Albert Ier, Prince souverain de Monaco,' Fasc. XL., Part I., par Gunnar Isachsen. Monaco, 1912.

‡ G. De Geer, 'Om Gradmätningsnätets framförande öfver södra och mellersta Spetsbergen,' scale 1:1,000,000. Stockholm, *Ymer*, Årg. 20, 1900.

§ C. J. O. Kjellström och A. Hamberg, 'Karta öfver Kung Karl's Land upprättad under 1898 års svenska Polarexpedition,' scale 1:200,000. Stockholm, *Ymer*, Årg. 19, 1899.

‖ A. G. Nathorst, 'Två Somrar i Norra Ishafvet,' I. Map on 1:500,000. Stockholm, 1900.

¶ C. J. O. Kjellström och A. Hamberg, 'Karta öfver Beeren Eiland uppmätt under 1898 års svenska Polarexpedition,' scale 1:100,000. Stockholm, *Ymer*, Årg. 19, 1899.

** C. J. O. Kjellström, 'Karta öfver Van Mijen Bay och Bell Sound upprättad under 1898 års svenska Polarexpedition,' scale 1:200,000. Stockholm, *Ymer*, Årg. 21, 1901.

†† 'Karte der Baie Recherche und van Keulen Bay auf Spitsbergen während der von A. G. Nathorst geleiteten schwedischen Polarexpedition 1898, photogrammetrisch aufgenommen,' scale 1:100,000. Stockholm, *Vet. Ak. Handl.*, Bd. 39, No. 6, 1905.

Wijde fjord and the rest of North-East Land, Barents and Edge islands, is based chiefly on the Admiralty chart No. 2751 (1911), and the Reichs-Marine-Amt chart No. 155 (1911). The eastern branch of the Ice fjord from and including Skans bay to Coles bay is taken from De Geer.* Ekroll harbour, on Edge island, is laid off according to Martin H. Ekroll's special map of his wintering-place, 1894–95. Scale 1:25,000. This map is not yet published, but will be included in the new edition of Isachsen's charts.

The mean variation of the compass at the east end of the base-line on Foreland plain on June 30 and July 16, 1910, was 12·6° W.; in Virgo bay on August 21, 1910, 13·5° W.; and at Sabine point on August 22, 1910, 13·2° W.† The magnetic variation is probably decreasing 10′–15′ annually, and is, according to the Reichs-Marine-Amt chart (1911), along a line Bear island—Cape Barkham (Barents island)—Cape Irminger (North-East Land), about 1¾° W., and along a line Dun islands—Cape Thordsen—Verlegen Hoek about 6¾° W. in 1914. The greatest difference between high and low water is about 1½ metre (5 feet). The harbour time is about one hour.‡

With regard to the names on the map, the sites of mountains are indicated by a point and the name; the direction and extension of valleys and glaciers, where it has been possible, are explained by the direction and length of the names. With regard to the selection and the form of the names, reference must be made to the map; it would lead too far here to discuss the intricate and difficult nomenclature of Spitsbergen. In order to give an idea of the heights and depths, some figures are given on the map (feet and fathoms).

As will be seen, the highest mountains on West Spitsbergen are to be found in the Chydenii range, where Mount Newton and Mount Poincaré attain a height of 5676 and 5446 feet. Then we have Mount Eidsvoll on Haakon VII. Land, with a height of 4750 feet, and Mount Hornsundtind on Sydkap Land, 4690 feet.

Shallows close to the water-line are marked with a cross on the sea. Tourist steamers must not, even in waters where soundings have been taken, neglect to use great caution, and more "especially in regions where the geological structure is irregular." ‡ A good arrangement for the prevention of accidents, as some Norwegian tourist steamers do, to go two together. Since the sketch-map of van Keulen (*c.* 1710) the charts have often shown a sandbank or an island, sometimes two, in Storfjord, and although a depth of at least 50 metres (27 fathoms) has been

* G. De Geer, 'The Coal Region of Central Spitsbergen,' with a map on 1:300,000. Stockholm, *Ymer*, Årg. 32, 1912.

† A. Alexander, 'Observations Astronomiques faites par l'Expédition Isachsen,' *Kristiania, Vid. Selsk. Skr.*, I., No. 12, 1912, p. 4.

‡ G. Isachsen, 'The Hydrographic Observations of the Isachsen Spitsbergen Expedition, 1909-1910,' *Kristiania, Vid. Selsk. Skr.*, I., No. 14, 1912, p. 6.

sounded at the place where these shallows should be situated, it is not impossible that this bank "may sometimes be rediscovered at another place, and it is, at all events, better to have vague warnings than none at all." *

On the charts a shallow in 3 fathoms of water is shown at the entrance to Ice fjord; this shallow is, however, laid off too far north, as it is situated on a line with Mount Vardeborg and the mountains at Cape Delta.

Northward of Spitsbergen the bottom drops evenly towards the deep Polar sea. Southwards the Spitsbergen group of islands is connected with Bear island by the comparatively shallow Spitsbergen bank. While the soundings between this bank and Norway do not exceed 500 metres (275 fathoms), the depths of the Greenland sea are considerably greater. Geographically, Spitsbergen may therefore be considered as connected with Norway.

On comparing the modern map of Spitsbergen with earlier maps, it will be seen that the shape of the archipelago has of recent years undergone great changes. These changes are especially noticeable on the stretch of coast between Bell sound and the north coast. Nordenskiöld Land has been surveyed, and Oscar II. Land has got its natural limits to the north, Haakon VII. Land to the east, and Albert I. peninsula to the south.

Very few countries have a more interesting history of exploration than Spitsbergen. Of course it is out of the question to go into this matter in the present article; only I want to deal on this occasion with a single little locality, viz. the present *Hamburger bay*, whose history has just been fully investigated.

Hamburger bay was first marked by Giles and Rep on their map (*c.* 1710). Sir Martin Conway writes in his book, 'No Man's Land' (Cambridge, 1906, pp. 353, 354), "North of it (Hamburger bay) is a smaller bay not marked on any modern chart except the French chart No. 929. Vrolicq occupied the bay in 1633, and it is named on his map (1634) Port Louis or Refuge françois. In many Dutch charts, from Valk and Schenk's (*c.* 1662) to Giles and Rep's (*c.* 1710), it is named Baskes bay."

The survey made by me in 1907 shows, however, that there exists no bay between Hamburger bay and Magdalena bay. On the other hand, the bay which on Vrolicq's map is called Port Louis or Refuge françois, must obviously be the present Hamburger bay; this is also borne out by historical researches made by Dr. Arnold Ræstad.† In 1633, Vrolicq, who was fishing in French interests, was driven away by the Dutch from Kobbe bay or Port St. Pierre. Vrolicq then took up a new station in a more southern bay, which he called St. Louis or Refuge françois. In 1637 he was also expelled from this place by a Dano-Norwegian frigate under the

* G. De Geer, 'The North Coast of Spitsbergen, western part,' with map on 1:100,000. Stockholm, *Ymer*, Årg. 33, 1913, p. 14.

† A. Ræstad, 'Norges Höihetsret over Spitsbergen i ældre Tid. Kristiania, 1912,' pp. 48, 52, and 53.

command of Captain Corfitz Ulfeldt, who had been sent out by Christian IV. to enforce the supremacy of the Dano-Norwegian crown over Spitsbergen. The catch and fishing-gear of Vrolicq were confiscated, and Vrolicq with his ships was forced to leave the bay, which afterwards went by the name Ulfeldt bay, and was used by the Dano-Norwegian whalers. From the instructions issued to Captain Ulfeldt, it appears clearly that Port St. Louis is the subsequent Hamburger bay, as he had received orders to close the harbour by blocking it up. As a matter of fact, the entrance to the bay (Hamburger bay) is only 800 feet wide and 13 to 16 feet deep. Inside, the bay widens out, forming an excellent harbour with a depth of up to 10 fathoms. It is the same bay which in 1645 was assigned by the Dano-Norwegian king to those Hamburgers who by a royal licence had begun to fish at Spitsbergen in 1644, and which since that time has been called Hamburger bay.

During later years the bay does not appear to have been visited. The Swedish expedition of 1861 * could not make out the bay on the voyage from Magdalena bay to Cross bay, and as others had the same experience, it was generally believed that the glacier at the bottom of the bay had come down and filled it up. The bay was therefore only marked on the charts with dotted lines as iced down. As a matter of fact, the entrance is rather difficult to make out, the points on both sides being very low and join on to the high land at the back.

On the east coast of Spitsbergen alterations from previous maps are also very perceptible, the coast-line having been subject to great changes, and the bays have altered their form and extension. If one goes further back in time, say before 1898, King Karl Land was practically unexplored (Wyche's islands), and Hvitöy island was a geographical problem (Giles Land).

At the following places, commencing from the north and down along the west coast, there are one or more houses which have been standing, and will probably be standing for several years:—

At Cape Crozier, Treurenberg bay: Swedish station, 1899–1900.
„ Mossel bay: (Polhem) do. 1872–73.
„ Virgo bay: Camp Wellman and Mr. Pike's house.
„ Magdalena bay: north side: English mine.
„ Port Ebeltoft: German station from 1911.
„ Tinayre bay, north side: English mine.
„ Port Peirson, Blomstrand peninsula: English mine.
„ King's bay, Lovén island: English mine.
„ do. Coal haven: Norwegian coal-mine.
„ Cape Thordsen: Swedish station, 1882–83.
„ Mimer bay: Swedish coal-mine.
„ Advent bay: Advent city, English coal-mine, laid down.
„ do. Longyear city: American coal-mine.
„ Coles bay, east side: Russian coal-mine.
„ Cape Heer: Norwegian coal-mine.

* K. Chydenius, 'Svenska Expeditionen till Spetsbergen år 1861 under Ledning af Otto Torell,' Stockholm, 1865, p. 346.

At South of Cape Heer, *ibid.*
„ Cape Finnes, Green harbour: Norwegian whaling station.
„ do. Norwegian wireless telegraph station, Norwegian coal-mine, and American coal-mine.
„ do. the inner part of Green harbour: Norwegian coal-mine.
„ Muyden haven, at the coast under Mount Coal, at the south entrance to Braganza bay, at van Keulen bay, at Recherche bay, at Dun islands, at Horn sound, and on Thousand islands: English mines.
The houses at Magdalena bay, Tinayre bay, Port Peirson, on Lovén island, at Muyden haven, house south of Mount Coal, at Braganza bay, van Keulen bay, Recherche bay, Dun islands, and on Thousand islands belong to the Northern Exploration Company, London.
On Axel island: Norwegian station.
At Cape Barry, Braganza bay, north side: Swedish coal-mine.
„ Horn sound, south side; Russian station, 1899–1900.
„ Hvalros haven, Bear island: Norwegian whaling station, laid down.
„ North haven, do. Norwegian station.

In addition to these houses there is a lot of huts set up by hunters who have wintered there in order to catch bears, foxes, and reindeer. These expeditions generally consist of four to six men distributed on two to three stations. These primitive houses often remain standing at the same place for only one winter. The two huts at Freeman strait and the two at van Keulen bay have been erected by fishermen who during the summer have been catching white-fish (*Delphinopterus leucas*). As a rule these expeditions are only provisioned for one year. If it then happened that the hunters, owing to difficult ice-conditions, could not be taken back, or if they were themselves unable to get out with their vessel, the second winter was often fatal. We have many reports about hunters having been relieved in the nick of time, many remarkable rescues, while others perished from hunger and scurvy. During later years the hunting expeditions to Spitsbergen have considerably decreased owing to the poor economical result. We must therefore hope that the stock of game may soon commence to increase again, what is sorely needed.

The later Norwegian whaling at Spitsbergen and Bear island commenced in 1905 with sixteen whalers. As the catch gave a poor result, the fishing has gradually ceased, the number of vessels being in 1912 reduced to six. In 1913 and 1914 no fishing has taken place. There has only been one station on shore, viz. at Cape Finnes, the rest being floating oil refineries. The cod-fishing that went on at Spitsbergen during the years 1870–83 has since that time not been taken up again. The workable coal-beds are almost all of them situated on Nordenskiöld Land, between Ice fjord and Bell sound. Here will be found Norwegian, American, English, Swedish, and Russian claims. The Norwegian wireless station was built during the summer 1911, the first telegrams being exchanged on November 24 the same year with the corresponding station at Ingö, near Hammerfest. The station is at the same time a post-office,

the postal communication with Norway being kept up by subvention from the Norwegian Government.

The small map in the right-hand corner (scale 1:35,000,000) shows Spitsbergen in relation to the surrounding countries. Greenland is represented on this map according to the latest surveys made by the last Danish expeditions. On Greenland and Iceland numerous names are given. Norway and Sweden, on the other hand, only such names that may be of interest in connection with voyages to Spitsbergen.

Of railway lines in Norway and Sweden, only such lines have been laid off as lead to towns where voyages to Spitsbergen start. By broken lines is indicated the limit of ice in various years and seasons.

Deliberations have taken place between the countries most interested in Spitsbergen as to how the many remarkable features of nature, such as, for instance, the hot springs at Bock bay, discovered on Isachsen's expedition in 1910, the fauna and flora, are to be best preserved. Of course such measures will be more and more imperative as the number of industrial undertakings and tourist trips are increasing. At the Conference which took place at Christiania by representatives of Norway, Sweden, and Russia it was, among other things, agreed upon that places offering special scientific interest should not be occupied. Proposals for regulations relating to hunting and fishing, use of poison and explosives, and measures for the protection of the Arctic flora were also discussed.

REVIEWS.

EUROPE.

Alpine Climbs.

'Peaks and Precipices: Scrambles in the Dolomites and Savoy.' By Guido Rey. London: T. Fisher Unwin. 1914. 10*s.* 6*d. net.*

Monsieur Rey is known as the author of a spirited work on the most dramatic of all Alpine stories, the contest for the Matterhorn. The volume before us may best be described as the rhapsody of the modern mountaineer. The author has reversed the usual order of the mountaineer's progress, and turned in the middle of his carèer from the snow and icecraft afforded by the loftier peaks to the rock-scrambles, the desperate gymnastics, called for by their granite buttresses, the Aiguilles of Mont Blanc, or the dolomitic walls and pinnacles of the Venetian Alps.

Born an Italian, M. Rey writes with all the sustained eloquence which a language singularly emotional lends itself to, and his pages offer a contrast to the perhaps exaggerated reserve characteristic of the classical period of English climbing literature. Moreover, having outgrown the reckless, unconscious daring of early youth, he is better able to realize, and he enjoys fixing and recording, the mental impressions and depressions, the doubts and tremulous regrets, of those "bad five minutes"—to quote Leslie Stephen's phrase—when the issue of the adventure seems more or less uncertain.

The climbs described in these pages are among the most arduous that have been accomplished of late years within the Alpine region. They could hardly

have been more eloquently and vividly described, and a number of admirably selected photographs not only illustrate the narrative, but give an accurate picture of the structure and fantastic details of the conquered crags and buttresses, of the contrast between granite wedges and dolomitic blocks and spires.

It would be ungrateful and out of place to repay an author who has been the first to write a readable volume on acrobatic adventure (Mummery's work included snowcraft and exploration) by an argument against the particular brand of mountaineering he has taken up with conspicuous success both as a climber and a writer. It has its place; and for its criticism it is enough to quote M. Rey's own reflections on the one occasion recorded here when he returned to one of the great peaks—the Aiguille Verte. He writes (p. 110): "That day and that mountain have left in me a memory of perfect peace. . . . I found here a new example of the peaceful beauty that belongs to the greatest peaks, and the enjoyment it afforded me seemed to have gained in serenity and in dignity. My mind, weary of the ceaseless secret conflict between its pride and its weakness that is inevitable during the struggle against unending difficulties, opened out to receive wider impressions and clearer visions.

"Lawful and reasonable climbs such as these delighted the great pioneers, who were wiser than we, and who taught us how the Alps should be loved."

It is well for a man to rejoice in his legs and his muscles and his nerves so long as he can keep his mind open to the larger lessons of the mountains. M. Rey has shown he is able to do this. He is to be congratulated on a translator who has done a difficult job with altogether exceptional ability and success.

D. W. F.

ASIA.

Russian Turkestan.

'Le Turkestan Russe.' Par A. Woeikof, Professeur honoraire de géographie physique à l'Université de Saint Pétersbourg. Paris: Colin. 1914. *Maps and Illustrations.* 8 *fr.*

The author, who by associations and long study had qualified himself thoroughly to deal with the subject, took the opportunity in 1912 to visit Turkestan, and spent four and a half months in the province, in the course of which period he clearly made the very best use of his time, and collected a considerable amount of information which a non-Russian visitor would have had difficulty in acquiring. As is well known, the variations of temperature, geological and geographical features of Turkestan are considerable, ranging from the sands of the trans-Caspian deserts and the plateau of the Ust Urt to the highlands of the upper Oxus, where mineral resources are varied and fairly plentiful. Among the more important minerals are valuable marble quarries near Fedchenko, not far from Andijan, sulphur and deposits of petroleum in the Aralo-Caspian basin and in Ferghana. So far, however, much has not resulted financially from the attempts to develop these resources, but the scanty topographical knowledge of the country is chiefly responsible, no doubt, for the small progress hitherto made. Forests, too, have not yielded much, as Ferghana is, like England, rich in trees, but not in forests. The acquisition of the regions that go to make up Turkestan has been made necessary by the raids and incursions of the nomad aborigines, and has placed its masters in possession of a sunny and highly agricultural country yielding products which could not be cultivated in Russia in Europe or Siberia. At present Turkestan supplies nearly half the cotton used in Russian factories, as well as many other raw products, and forms an important market for the

manufacturers of the country. Moreover, since railways have been opened and brigandage abolished, adjacent countries such as Khorasan, northern Afghanistan, and Kashgaria have opened up a thriving trade with Turkestan, while Russian administration has given the land peace, security, and if not ideal government, at all events one vastly superior to that which preceded it. One conspicuous defect, in M. Woeikof's opinion, is that the upper government officials have a very imperfect acquaintance with the native languages, while their subordinates have no regular defined or permanent employment, with concomitant advantages as regards pay and annual leave, such as are enjoyed in the British and Dutch East Indies.

AMERICA.

The Upper Amazon Basin.

'The Upper Reaches of the Amazon.' By Joseph F. Woodroofe. London: Methuen & Co. 1914. Pp. xvi., 304. *Map and Illustrations.* 10*s.* 6*d. net.*

This book is the record by a young Englishman of between seven and eight years' residence in the upper Amazon basin, during which period he experienced many vicissitudes, at one time working his way up to the command of a prosperous business, but for the most part serving as an employé in the rubber-collecting industry. He ranged from Manaos to beyond Iquitos in the one direction, and to the Madeira-Mamoré railway in the other. In the course of his varied employment he became associated with the notorious company exploiting the rubber resources of the Putumayo. His participation in the business after he became aware of its character he excuses by explaining that he himself was "a victim of peonage," being accounted heavily in debt to his patrons.

Having this basis of experience, he has written this book with a twofold object—to warn other young Englishmen of the dangers of employment in the outlying parts of the Amazon basin, and to expose the evils attendant on the collection of rubber, not only in the Putumayo, but, to a greater or less extent, throughout the area which came within the range of the author's observation. About two-thirds of the book is occupied with the personal narrative; the rest is devoted to a generalized account of the conditions under which the rubber industry is carried on, natural history notes, and a few hints for travellers. Particularly instructive is a detailed description and estimate of the cost of starting and working a "seringal," or rubber estate, in the Amazonian forests. From this it appears that the workers are not the only sufferers from a vicious system, under which the masters themselves are often in a sorry position.

Apart from its main theme, the book is interesting for its ingenuous details of life and travel in the upper Amazon basin. Without literary graces, and lacking the scientific value of the record of a trained observer, it presents in popular form a good deal of information, and should do much to spread knowledge of a region which, in the ordinary way, comes little into the light, but which has already attained economic importance and has potentialities of vast development.

POLAR REGIONS.

Antarctic Domestic Economy.

'Antarctic Adventure. Scott's Northern Party.' By Raymond E. Priestley. London: T. Fisher Unwin. 1914. *Map and* 150 *Illustrations.* 15*s. net.*

Mr. Priestley's detailed account of the life of the members of Scott's Northern Party, under the command of Lieut. Campbell, presents many features of great

value. The expedition, originally destined for the exploration of King Edward Land, made itself famous in Antarctic history by the remarkable journey along the coast of Victoria Land after the failure of the relief ship to pick up the party. The book is disappointing in one way only, and we mention this to get it over, as it need not be dwelt upon. It does not read smoothly, there are repetitions of phrases with a very tiresome iteration, and the proof-reading falls short of perfection, occasionally failing to circumvent the diabolic ingenuity of the linotype machine, as on page 123. As other examples, "Armytage" appears for "Armitage" on page 34, "eyelids" for "eyebrows" on page 99, and "hydrometer" for "hypsometer" on page 373. Such trifling defects are more than compensated by the fine collection of photographs with which the work is profusely illustrated, and these are worthy to stand beside the best that the Antarctic, always a happy place for photography, has yielded to any expedition.

This is not the official record of the Northern Party, and thus it would be unappropriate to deal here with such questions as the choice of a landing-place or the provisioning of the sledge-party landed in the second year, though these are points of much interest in the history of Polar exploration.

Mr. Priestley does justice to the work of the Southern Cross expedition under Mr. Borchgrevink, who was the first to land at Cape Adare and to winter on the Antarctic continent. Scott's Northern Party of six found, in the course of the year they spent on that inhospitable beach, abundant corroboration of Borchgrevink's statements as to the impossibility of carrying on exploration thence either by land or over the sea ice, and, except by supplementing the collections and adding another year to the meteorological record, the stay of the second wintering party contributed little to our knowledge. One interesting fact referred to is the extraordinary barrenness of the dredgings off the beach, explained by the tidal currents constantly driving great icebergs ashore and thus scraping away any forms of organic life that may have found a footing on the coastal slopes. As a result of the frequent severe gales, a heavy swell breaks upon the beach, carrying with it great boulders of ice, which as the breakers curl over are flung violently on shore far above high-water mark; as Mr. Priestley observes, "pieces the size of a cricket-ball were thrown like a stone from a catapult past our heads to break in fragments on the pebbles behind." Nor was this the only form of bombardment to which the dwellers on the beach of Cape Adare were subjected. In the heavy gales pebbles were caught up by the wind and hurled with terrific velocity. One remarkable instance is given of such a pebble being driven through the vacuum bulb of a solar radiation thermometer, not breaking the glass like a stone, but cutting a clear round hole like a rifle bullet. It says much for the strength of the huts that no serious damage was done to that constructed by the party, while Mr. Borchgrevink's hut, which had stood the storms of thirteen years, was found sufficiently sound to serve as a storehouse and workroom after slight repair. Further light is thrown on the extraordinary local character of these terrific winds, and a most interesting account is given of an occasion at Cape Penelope where the snow lay undrifted and unruffled by wind while blizzards were raging with their characteristic ferocity at Cape Adare less than 10 miles away.

The greatest value of Mr. Priestley's book lies less in his remarks on scientific observations than in the detail with which he sets forth the shifts and expedients of a camp life, such as the pioneers of geographical exploration never imagined. The compensation for the terrible weather experienced where the ice-clad land of Antarctica meets the sea lies in the abundance of food and fuel yielded by the animal life nourished in the waters. Although practically

limited to seals and penguins, the resources are more numerous and more sufficient than one could imagine. Already, at Cape Adare, experiments had been made, and important improvements effected in the use of blubber for giving light and heat, but it was not until the second winter that the art of living and preserving health on a minimum of the necessities and none of the comforts of life was brought to a pitch that can almost be designated perfection. The six men were landed by the *Terra Nova* at Evans Coves, about midway between Cape Adare and Scott's main base at Cape Evans, on January 8, 1912, for a short trip, and on February 7 they began to feel anxious regarding the return of the ship, and reference is made later to their provisions being only sufficient for six weeks' sledging. The ship did not return, and by the end of February the party set themselves to prepare to pass their second winter, without a hut, without adequate clothing, and without either fuel or food for more than a few weeks. It is the description of this wintering which forms the unique interest of the book, recalling in many ways Nansen and Johansen's wintering in Franz Josef Land, after leaving the *Fram* in 1895. The winter residence was a cave excavated in a snow-drift, so low in the roof that none of the party could stand upright, though why it was necessary to submit to this uncomfortable condition is not made clear, but, no doubt, there was some good reason why the cave could not be dug down deeper. Pebbles from the neighbouring beach were spread upon the floor and covered with quantities of dry seaweed, which was fortunately found in the neighbourhood, and furnished a non-conducting carpet for the sleeping-bags. Except a small ration of biscuits, the food brought with the party was saved for the spring sledging back to the main base, and during the winter the party resolved to live upon the country. A fascinating account is given of the gradual development of blubber lamps and cooking-stoves, the great difficulty being the supply of wicks, as there were no spare textiles of which to make them. At length the brilliant discovery was made that the old much-weathered bones of the bleached seals' skeletons were porous enough to serve the purpose, and the light and fuel problem was triumphantly solved. Yet at the best the burning blubber emitted a peculiarly acrid and irritating smoke, to which one of the party applied the appropriate west-country name of "smitch."

A sufficient, although barely sufficient, number of seals and penguins was secured before the autumn migration to provide food and blubber to last until the return of the animals in the spring, and although some of the party suffered severely from ptomaine poisoning, they managed to pull through, and found the livers and seals' brains attractive articles of diet, the latter having been used for the first time in Antarctic history. Water melted from sea-water ice was used in default of salt in cooking the food, and only one of the party found any bad effect from the use of brine containing so large a proportion of sulphates and magnesium salts.

Although on the whole fair health was maintained during the three months of darkness, the life must have been one of unceasing physical misery. The spirits of the party, however, rose superior to their environment, and, contrary to all precedent, the six men grew in friendliness and good-nature as time went on to such an extent that their attachment to each other was the cause of not a little chaff when they rejoined the surviving members of the main party and returned on board the *Terra Nova*. Mr. Priestley sums up his experience as follows:—

"I do not for a moment say that any of us would care to repeat that winter. Indeed, I believe that another similar experience would kill most of

us, or drive us mad; but it is certain that our pleasures during the hardest winter any of us are likely to see were as acute as our pains. We could get as much pleasure out of an unexpected lump of sugar, or a peaceful day after the trials of a day as messman, as the most costly luxury or the most entrancing holiday could give to us now.

"Half the fascination an Antarctic expedition possesses is to be found in the sharpness of the contrasts experienced during its course, for it appears to be true that a hell one day is liable to make a heaven the next. It is probable, indeed, that here we have another of the clearest notes that together make up that elusive something we term, for want of a better name, 'the Call of the Antarctic.'"

H. R. M.

GENERAL.

Educational Books.

(1) 'Environment: A Natural Geography.' By G. R. Swaine. Pp. 226. *Maps and Pictures.* Ralph, Holland & Co. 1*s.* 9*d.*

There are three forces which manifest themselves in regard to human occupation of the Earth: the control due to the environment, the inherited customs and habits of man's forerunners, and the caprice of the present generation. To teach geography, it is necessary to present a survey of the globe so ordered that the effects of these forces may be readily perceived, grouped, classified, and set in due perspective. The tradition has been to teach in relation to political boundaries, and there is much to be said in favour of retaining the political boundaries in order to maintain the due perspective which involves the appreciation of relative importance. A break away from tradition occurred when it became usual to attempt to determine geographical regions; and this attempt allows for the necessity for perception and classification but tends to ignore the question of perspective, the need for outlook. Hence, we have most frequently a compromise between regions and countries. Mr. Swaine assumes a knowledge of countries topographically and presents all the examples of a type of region together in a chapter; *e.g.* North island (New Zealand) is in one section and South island elsewhere, Chile is divided between two sections. The net result is a general scrappiness and lack of proportion which appear to militate against the use of Mr. Swaine's book in schools.

(2) 'A Regional Geography of the Six Continents.' Book 1. Europe. By E. W. Heaton. London: Ralph, Holland & Co. Pp. 127. *Maps and Diagrams.* 1914. 1*s.*

"What is a natural region?" To many teachers of geography this is a perplexing question, to which they fail to find a satisfactory answer, and this little book will not avail them much. Take the chapter "The North Sea as a Natural Region"; the sole basis for the selection of this region appears to be the shallowness of the sea and the consequent fisheries. The region is divided into four portions: (*a*) the German outlets to the North sea; (*b*) the German Rhine; (*c*) Holland; and (*d*) Belgium; and the bulk of the description of each section of the region refers to topographical facts based upon the connecting link of a river.

"The first striking peculiarity of Mediterranean climate is that the rain

falls chiefly in winter and rather before Christmas than after. The rain-bearing wind starts as a south-west warm wind from the dry belt of North Africa. It is thirsty as it blows over the Mediterranean sea, and picks up much water-vapour as it crosses. Those mountain ranges which run north-west to south-east catch the full force of the wind and, where they rise 6000 to 8000 feet, lead to copious condensation" (p. 73). This naïve explanation of the winter rains on the Dalmatian Alps does not agree with the wind directions shown upon Buchan's map. "Thus, in winter, there is an average difference of 10° F. between the North sea temperatures and those of the French seas" (p. 52). Hann's map gives the air temperature over the North sea in January as approximately 37° F., and over the Bay of Biscay as over 43° F. Our own official statistics give the temperatures of the surface waters of the North sea and English channel as respectively 43° F. and 49° F. in January.

(3) The Atlas Geographies. Part III. Senior Geography. No. 1*a*, 'British Isles.' By T. Franklin, E. D. Griffiths, and E. R. Shearmur. Pp. 120. 1*s.* 10*d. net.* No. 4, 'Africa.' By T. Franklin and E. D. Griffiths. Pp. 116. 1*s.* 6*d. net.* W. & A. K. Johnston, Ltd.

These books combine the atlas and the text-book; the text is based upon a consideration of the maps, and is supplemented by sets of exercises which require the pupil to carry out in similar reasoned fashion additional inquiries. The maps are numerous and some of them distinctly helpful, but a protest should be lodged against the reproduction of the maps such as that entitled the position of Edinburgh; the route maps also contain too much detail for school use. In the volume on Africa the maps are models of what school maps should be; but in the climate maps (p. 7), the isotherms should have the symbol for degrees added to the numbers, and the isobars are given without reference in words and without the symbol for inches.

The method adopted by the authors ensures that no statements of fact are made in isolation, there is a causal connection given in all cases, so that the pupil will obtain a reasoned inlook over the country studied. The net result is that the pupil's attention is called to details which appear unnecessary, and that he is not directed to the wide sweep of an outlook over the country in relation to the rest of the world. The facts are studied intensively as it were *in situ*, without emphasis upon their relative importance.

THE MONTHLY RECORD.

THE SOCIETY.

Alien Enemy Members and Fellows.—At the meeting of the Council on February 8 it was resolved that the names of alien enemies resident abroad, who are Honorary Members, Honorary Corresponding Members, or ordinary Fellows of the Society, should be removed from the list of the Royal Geographical Society during the continuance of the war.

EUROPE.

Lake Oulujärvi, Finland.—A minute study of the coast features of this lake, the third largest in Finland, has been carried out by Dr. I. Leiviskä, who has set

forth the results in the *Annales* of the Finland Academy of Sciences, Series A, vol. 3, No. 12. The lake consists of a main portion running north-west (divided in two by the large island of Manamansalo) and a smaller portion running north-east; the maximum breadth being about 24 kilometres, and the total length about 62. Its area is 1002 square kilometres, and the greatest depth about 34 metres. The lake lies between the lower and more level coastal region and the higher and more hilly interior, and the nature of its shores varies accordingly—extensive moors alternating in the west and north-west with stony, wooded, morainic deposits, while the eastern part is immediately bordered by lines of heights. The whole district is also traversed by a belt of sand-ridges. The rock formations likewise vary greatly between the west and east, being chiefly granite to the west, while to the east there is much more variety. The form of the coast naturally varies greatly, and Dr. Leiviskä distinguishes no fewer than eight main types, from rocky shores and shingle beaches, and flat marshy or wooded coasts, to eroded sandy cliffs. Each of these, with its subdivisions, is minutely described and illustrated. Whereas the formations are very similar to those on the coast of the Gulf of Bothnia, which Dr. Leiviskä had previously studied, the forms of the shores show considerable differences, those due to erosion preponderating, on the lake, over those due to deposition. A special section is devoted to the erosion forms, which are seen chiefly where the sandy belt touches the coast. Apart from the nature of the material and its exposure to the considerable waves of the lake, an explanation of the intensity of erosion is suggested in the great fluctuations of level, which between April (low water) and June (high water) exceed 1 metre, and even approach 2 metres. The occurrence of high water immediately after the disappearance of the ice is another factor favourable to erosion. The eroded material is piled up by the surf in sandy or gravelly banks which may be found practically all round its circumference. The influence of the ice on the forms of the shores is clearly traceable, though much of its effect is soon removed by the waves. Among the most characteristic effects are the ramparts of angular blocks and shingle, which cannot be thrown up solely by the surf.

AMERICA.

Recent Subsidence of the New Brunswick Coast discredited.—It will be remembered that the question of supposed recent changes of level on the North American coasts has been taken up within the past few years by Prof. D. W. Johnson of Harvard, who has held that the facts supposed by some to bear witness to such changes of level can be otherwise explained (cf. *Journal*, vol. **40**, p. 335; vol. **42**, p. 152). A study of the question has lately been undertaken, with special reference to the coasts of New Brunswick, by Mr. J. W. Goldthwait, who, during field work in 1911, visited a number of localities where so-called evidences of modern subsidence are to be seen. Before doing so he had conferred with Prof. Johnson, and co-operation was arranged between the Canadian Geological Survey and the Shaler Memorial investigation already in course of prosecution under Prof. Johnson's direction. Mr. Goldthwait's conclusions, as set forth in *Museum Bulletin* No. 2 of the Canadian Survey, appear to be in entire agreement with those of his fellow-investigator. He examines each of the arguments for the subsidence theory in turn, and finds that in each case the evidence is at least inconclusive. The rapid recession of cliffs and beaches which has been described is only, he thinks, what might be expected if the coast had been stable for centuries. The existence of drowned valleys shows that there has been subsidence in the past, but this proves nothing as to modern movements; the valleys being apparently products of pre-glacial or inter-glacial erosion sub-

sequently drowned deeply and only partially uplifted again. Barrier beaches, again, are normal features of the simplification of an irregular shore-line; the lagoons behind them being most naturally explained as bays shut off by the growth of reefs between headlands. The disappearance of the hooked ends of recurved spits beneath the surface of lagoons is what necessarily occurs on shores where no change of level is in progress. Where trees are said to be dying through submergence by salt water, this may be due to recent increase in the range of tide; and the phenomenon is certainly not general along the coast, as it would be if this were rapidly subsiding. The peat-bogs, whose bottoms have been said to reach 10 or 15 feet below high-tide mark, were found to extend only 2 or 3 feet below that level, and may have been formed in closed fresh-water basins whose floors were not below mean-tide level. Lastly, a detailed survey of the beaches on Grande Plaine, Miscou island, indicates, in Mr. Goldthwait's view, that so far as these are true wave-built beaches they testify rather to coastal stability than coastal subsidence.

Oceanographical Cruise of the "Grampus," 1914.—Continuing the work of the previous two seasons under the auspices of the Bureau of Fisheries, the U.S. schooner *Grampus* carried out oceanographical investigations in the coastal waters of the eastern United States during the summer of 1914, under the direction of Dr. H. B. Bigelow. The results, as outlined in *Science* for December 18 of that year, will evidently be of considerable interest when worked out, although the work had to be curtailed to some extent owing to the war. They include investigations of currents, salinities, temperatures, and plankton of the waters in question. According to the programme for 1914, special attention was to be devoted to George's bank, important oceanographically because of its position as a rim between the cold water of the Gulf of Maine and the Gulf Stream; to the effect of the St. Lawrence water both on the coast water further south and on the Gulf Stream; and to the possible influence of the Labrador current on the coasts of the United States. The vessel was provided with a thoroughly modern outfit for the work, and the method of procedure was to run successive sections in a direction normal to the coast; this was carried out as far as Halifax. The first two sections, outward and return, were concerned with the Gulf of Maine and George's bank as far as the continental slope, well within the sweep of the Gulf Stream. Another, of great interest, led across the deep gully between George's and Brown's banks, which forms the only connection between the basin of the gulf below the 100-fathom contour and the deeps of the Atlantic. Observations off Shelburne, Nova Scotia, were also valuable as revealing a strong set of the water to the south-west—an index of the long-shore flow of St. Lawrence water. Later, work was carried south down to and beyond Cape Cod, and a section across the continental shelf was started from No-Mans-Land, just south of Martha's Vineyard. Altogether the distance sailed was about 2000 miles, and complete data were taken at fifty-two stations, between the depths of 15 and 250 fathoms.

Broughton's Survey of the Colombia River, 1792.—Although the actual first discovery of the mouth of the Colombia is to be credited, in all probability, to the Spanish voyager Heceta, and it was also seen by the American Captain Gray, who gave it its name, the first exploration of its lower course was that of Lieut. Broughton, who commanded the *Chatham* under Vancouver during the first year's work of the latter on the coast of North-West America. An account of Broughton's ascent of the river is given by Vancouver in vol. 2, chapter 3, of his 'Voyage of Discovery,' evidently from a report made to him by his subordinate, and the question has lately been raised whether such original report, or other document describing Broughton's survey, might not exist at the Public Record Office. To settle the question the Hydrographer to the Admiralty, Captain J. F. Parry, instituted

a careful search in the Record Office among the captain's logs, captain's and lieutenant's letters for the year 1792, and he has obligingly communicated the results to us. If, he says, Broughton wrote a detailed account of the survey, this would probably have been sent under cover of one of Vancouver's letters of proceedings, since Broughton does not write directly to the Secretary of the Admiralty until his arrival off Cadiz in 1793. Now Vancouver's letters of proceedings from March, 1791, to February, 1793, are not to be found at the Record Office, but this is probably of less importance for the matter in question from the fact that such letters as are preserved deal little with the discoveries of the expedition, and any account of the survey of the Colombia would no doubt be but brief. A more important source of information would probably be Broughton's Journal, and this has been found at the Record Office. Captain Parry has sent us a copy of the entries in this between October 19 and 24, covering the period during which the *Chatham* entered the Colombia. The details given differ considerably from those embodied in Vancouver's narrative, and thus form an interesting supplement to the latter,* though unfortunately no account is supplied of the experiences of the boat parties, which started up the river on October 25. From this date the log records only the minor events of the ship's daily routine.

Earthquakes at Charleston.—The Charleston earthquake of August 31, 1886, is of special interest as it occurred in a district that might almost have been called aseismic. Mr. S. Taber (*Bull. Seis. Soc. America*, vol. **4**, 1914, pp. 108–160) has investigated the history of the district, and, excluding the immediate precursors of the great earthquake, finds records of not more than eight shocks (only two of which were regarded as strong) during the two centuries preceding 1886. After the great earthquake, however, shocks occurred more frequently. From 1886 to 1897, there were 318 shocks, and from 1898 to 1913, 77. The greater part of Mr Taber's memoir is occupied with an inquiry into the effects of various meteorological and astronomical phenomena on the frequency of these earthquakes. Though it is an inquiry which should extend over many districts, the main results are worthy of notice. Mr. Taber considers that most of the earthquakes are probably due to adjustments along a fault running from near Woodstock in a north-east and south-westerly direction, but that many of the minor shocks are caused by the adjustment of stresses set up by the more important movements. Changes of pressure, which affect differently the rocks on the north-west and south-east sides of the fault, are the chief factors influencing the frequency of earthquakes, and among these factors Mr. Taber regards rainfall, the level of the underground water-surface, and the barometric gradient as the most important; and changes in sea-level, variations in sunspot frequency, and the attraction of the sun and moon as of little or no consequence.

Miss Keen's Explorations in Alaska.—We regret that through inadvertence, when speaking in the January number (p. 79) of Miss Keen's glacier explorations in Alaska, her previous ascent of Mount Blackburn was described as a partial one. This was correct as regards her first expedition to the mountain, but the ascent was successfully completed during her second expedition in 1912, as described in the *Bulletin* of the Philadelphia Geographical Society for April, 1913, and elsewhere.

AUSTRALASIA AND PACIFIC ISLANDS.

Explosive Sounds in Australia.—The much-discussed question of the mysterious sounds heard by travellers and others, principally in arid regions like the centre of Australia, is once more raised in a paper by Mr. Thomas Gill, read to

* A fact that does not seem to be mentioned by Vancouver is the finding of another vessel—the *Jenny* of Bristol—at the entrance to the Colombia river.

Section E of the Australasian Association for the Advancement of Science in 1913, and since printed in the Report of the meeting (pp. 352–361). In 1912 reference was made in the *Journal* (vol. **39**, p. 615) to a discussion of the same subject by Dr. J. D. Cleland, who brought together a considerable number of cases in which the phenomenon had been observed. Mr. Gill, who does not refer to Dr. Cleland's paper or other general discussions, has likewise for a number of years collected reports on the subject, both from the published works of travellers, and personally from explorers and old bushmen, and his contribution is useful as placing these on record. He makes no attempt to offer an explanation of the phenomena, though quoting various suggestions made by those who have heard the sounds. These suggestions, like the descriptions of the sounds themselves, are so diverse—the cause being variously ascribed to earthquakes, electrical discharges, meteors, and other terrestrial and atmospheric phenomena—that there can be little doubt that the sounds are not all attributable to one and the same cause.*

Point Samson, N.W. Australia.—The copy of a despatch from the Governor-General of the Commonwealth of Australia has been forwarded to us from the Colonial Office, calling attention to the recent decision of the Government of Western Australia with regard to the spelling of the above name. Point Samson, near Cossack on the north-west coast, was named after an old resident of Freemantle, and is correctly spelled as above, although the form Sampson has been introduced into recent maps of Western Australia, as well as the Admiralty charts.

POLAR REGIONS.

The Macmillan Expedition in Search of Crocker Land.—News of this expedition (cf. *Journal*, vol. **42**, p. 496) was received in the United States towards the end of 1914, and is summarized in the January number of the *Bulletin* of the American Geographical Society. Mr. W. E. Ekblaw, geologist and biologist to the expedition, wrote on August 29, 1914, to the American Museum of Natural History, stating that the leader, Prof. D. B. Macmillan, had started over the ice in search of the reported land (apparently about the middle of March), accompanied by Ensign F. Green, engineer and physicist. From Cape Thomas Hubbard, at the northern extremity of Axel Heiberg island—the point from which Peary believed that he saw land in the far north-west—they sledged in that direction for 125 miles. During two days they thought they saw land ahead, but it finally proved to be mirage, and as they arrived nearly at the place where Crocker Land was placed by Peary without discovering it, they concluded that either it does not exist, or it is not in the locality supposed. The journey over the ice, which with the return occupied two months, was both difficult and dangerous. Most of the dogs were lost, and many leads had to be crossed on thin ice; while the day after the return to Cape Thomas Hubbard, in the middle of May, the ice broke up, and became a grinding chaos in which, if caught, the travellers must certainly have perished. Speaking of the party as a whole, Mr. Ekblaw reported that they were well and contented, fully provided for the year's work, in completion of their programme, which still lay before them. He himself, with Tanquary, had spent the summer at Umanak, North Star bay, studying the geology and biology. At the time of writing he was on Rasmussen's motor boat, 15 miles south of Etah, this Danish explorer having brought supplies and letters for the expedition so far. His help and courtesy to the party is spoken of in the warmest terms.†

* For a reference to somewhat similar sounds in Haiti, there usually ascribed to seismic influences, see *Journal*, vol. **41**, p. 389.

† Rasmussen is believed, from other information, to be planning a new expedition to Northern Greenland in 1915, with a view to continuing the work of his 1913 trip (*Journal*, vol. **42**, p. 546).

Russian Arctic Expeditions.—We are informed that the Russian press has published news received by wireless from Yugor Shar (Novaya Zemlya), to the effect that two Russian vessels which set out from Vladivostok in 1914 to repeat the attempt of the previous year to complete the navigation of the Siberian Arctic sea from east to west are wintering in 100° E., 15 miles apart. They had discovered *en route* a new island near Bennett island. The *Eclipse*, Captain Sverdrup's ship (cf. February number, p. 163), is said to have established winter quarters in 92° E. in the west of the Taimyr peninsula. It will be remembered that his voyage was undertaken for the purpose of searching for the lost Russian expeditions under Brussilof and Russanof respectively. As regards the first of these, the statement is made in *Petermanns Mitteilungen* for October last (quoted in the *Bulletin* of the American Geographical Society for January) that it has already met with a tragical ending. From two members of the expedition brought home by Sedof's ship, the *Saint Phoka* (*Journal*, vol. **44**, p. 411), from Franz Josef Land, it was learnt that Brussilof's ship, the *Saint Anna*, was caught in the ice of the Kara sea in 71° N. in August, 1912, drifting for a year and a half until she reached Franz Josef Land. The mate Albanof (one of the two rescued men) had left the ship on April 23, 1914, with thirteen sailors, at a point in 83° N., 60° E., north of Crown Prince Rudolf Land. Most of the party reached Alexandra Land, in the west of the archipelago, but here they separated, some going eastward by land, others endeavouring to reach Cape Flora in boats, but of the latter party only two reached their destination. All efforts on the part of the crew of the *Saint Phoka* to find either the remaining men or the ship were in vain. It is also stated that the *Hertha*, which went to Franz Josef Land last year in search of Sedof's party, found records concerning the fate of Sedof's expedition.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Rate of Continental Denudation.—A note in *Science* of December 25, 1914, by Dr. Charles Keyes, deserves attention as a warning as to the untrustworthy nature of estimates of the rate of denudation based on calculations of the matter carried down by a large river, in suspension or solution. In forming such estimates, the case of the Mississippi valley has been a favourite one with geologists, owing to the attention paid to this by Humphreys and Abbot more than half a century ago; but Dr. Keyes points out that factors have been left out of consideration which are specially important in the case of the Mississippi, rendering the choice of this as a typical example the most unfortunate that could be made. In particular it appears that the wind-borne dusts from the western deserts are alone probably depositing materials over the entire Mississippi valley faster than the river and its tributaries are carrying rock waste to the sea. Movements of elevation, again, such as have affected much of the Upper Mississippi valley since glacial times, have not, Dr. Keyes holds, been taken sufficiently into account. The elaborate stream measurements give no clue whatever to the absolute rate of continental lowering through erosion, but merely emphasize the relative impotency of stream work in general. It may be doubted whether the neglect of the other factors spoken of by Dr. Keyes is quite so general as he supposes, and in any case the work of rivers is at least one of the main factors in the geographical cycle by which the net result is produced, and it is surely permissible to endeavour to evaluate its individual effect, apart from that of other forces in play.

GENERAL.

Polar Medal for the Mawson Expedition.—As announced early in February, the King has approved of the award of the Polar Medal to the officers and men who took part in Sir Douglas Mawson's recent Antarctic expedition. It

will be remembered that the medal was awarded in 1913 to the members of Captain Scott's expedition of 1910–13.

The American Geographical Society.—The appointment of Prof. Isaiah Bowman to the post of Director and Librarian of this society has lately been announced. Prof. Bowman is widely known as one of the most energetic and capable of the younger American geographers, and valuable developments of the work of the American Geographical Society under his direction may be anticipated. It will be remembered that he has done good research work in the Andine region of South America, both in association with Prof. Hiram Bingham and independently (cf. *Journal*, vol. **44**, p. 232). As noted below, he is also secretary of the Association of American Geographers, and the two bodies are working in harmony towards the improvement of geographical education and cartography in the United States, an object towards which much thought and attention is being directed at the present time.

Association of American Geographers.—The eleventh annual meeting of this association was held at Chicago on December 29 and 30, 1914. The attendance ranged from thirty-eight to seventy-two, and the number of papers read was twenty-eight, out of a total of forty-two of which the titles appeared on the programme. From a copy of the latter with which we have been favoured, it is evident that the recent development of geographical study in the United States continues to be well maintained, and the nature of the subjects discussed shows that it is proceeding on satisfactory lines. Particularly striking is the attention now being paid to the applications of geography to social and economic questions, present-day students of the subject being not content to restrict themselves to the relatively barren fields of Mathematical and Physical Geography, important as these are as ways of approach to the more fruitful ground beyond. Among the subjects of this kind included in the programme may be noted: "Some Geographic Factors influencing Brazilian trade" (Prof. W. S. Tower); "West Indian Trade as a factor in the early development of certain ports" (Mary J. Lanier); "The influence of Trans-continental highways on the price of wheat" (N. A. Bengston); "Natural Economic Regions" (Prof. C. R. Dryer); "Regional characters in the growth of American cities" (Prof. Mark Jefferson); "Influence of geographic conditions upon Ancient Mediterranean Agriculture" (Ellen C. Semple); "Human relations in the Glacial Lake Plains of Ohio" (Frank Carney); and several others. The officers elected for 1915 include Prof. R. E. Dodge as president, Prof. Isaiah Bowman as secretary, and Prof. H. H. Barrows as editor of the Annals of the Association; Prof. Dodge having resigned the last-named post after five years' occupancy, during which he devoted much painstaking and efficient effort to the securing of a high standard of publication. A conference conducted by Prof. Fenneman on the definition of Physiographic Provinces in the United States resulted in definite progress towards that end, and among decisions arrived at it was resolved that a non-membership list of students and others desirous of receiving the programmes of the Association is to be maintained, at present limited to a hundred and fifty names; while the sum of $500, or about half the total inactive funds of the Association, was assigned to the joint research fund of the Association and the American Geographical Society. Steps were also taken for the appointment of a committee to assist Mr. Cyrus C. Adams in preparing a report on the raising of the Standards of Geographical Education in the United States, this report to form the basis of a discussion in December, 1915. The place of meeting for the next annual meeting in that month will be fixed later.

The Geographical Society of Philadelphia.—We are informed that this society has decided to hold monthly meetings for study and research, in addition

to the usual illustrated lectures on travel and exploration. The first meeting of the kind was held in January, when Prof. D. W. Johnson spoke on "The Physiographic Features of Western Europe, and their influence on the Campaign against France." The Philadelphia Society, under its energetic president, Mr. H. G. Bryant, has shown a decidedly progressive spirit for some years past, and the step just taken will no doubt conduce still more to its usefulness in popularizing geographical ideas and methods.

OBITUARY.

Vice-Admiral Sir George Strong Nares, K.C.B., F.R.S.

We regret to announce the death of Vice-Admiral Sir George Nares, on January 15, at the age of eighty-four. G. S. Nares was born in 1831, entered the navy in 1845 and served a commission in the Pacific on board H.M.S. *Havannah*. In 1851 he passed the examination for Lieutenant, and returning to England soon afterwards was appointed a mate in H.M.S. *Resolute*, Captain Sir Edward Belcher, in command of an expedition to the Arctic in search of Sir John Franklin and his companions. His early training thus gave him a knowledge of managing sailing vessels in all circumstances of wind and weather and experience in ice navigation. During his service in the *Resolute* he took part in sledge journeys, and became acquainted with conditions of Arctic travel.

Returning from the Arctic in 1854, he was promoted to Lieutenant on October 21 of that year, and served in the Mediterranean 1854 to 1856, when he was transferred to the *Illustrious*, a training ship for naval cadets—which was then being established at Portsmouth—and afterwards to the *Britannia*, which took her place. It was during this time that he compiled 'The Naval Cadets' Guide,' afterwards expanded into the well-known 'Nares' Seamanship,' a text-book which is still in use.

He had a remarkable influence over the young cadets, and a cruise with him in the sailing launch for instruction was always eagerly looked forward to and enjoyed. His zeal and energy were an irresistible stimulant to them in their training, and their admiration of him was great. He was promoted to Commander in 1862 for his good work in the training ships, which he continued in command of H.M.S. *Boscawen*, then a training ship for boys.

Nares next commanded the *Salamander*, a paddle-wheel vessel on the Australian station, engaged in keeping open communication with a party of marines established at Cape York. On his voyages backwards and forwards between Sydney and Cape York he did some useful surveying work, and on his return to England in 1867 he commissioned the *Newport* for hydrographic work on the Mediterranean station. While at this work he was promoted to Captain on June 1, 1869.

The approaching completion of the Suez canal necessitated a survey of the Gulf of Suez, and the *Newport* was selected to carry this out. At the opening ceremony in November, 1869, the French Imperial yacht *l'Aigle* headed the procession of sixty-eight vessels, and was the first ship through, but one of the large vessels grounded at the entrance of Lake Timsah, and all the ships following her had to secure to the banks of the canal. Nares went on in a boat to look at

the grounded vessel, and found there was a very narrow passage between her and the east bank, which he thought he could manage to get the *Newport* through, she having a right-handed screw. This was eventually done, and about 9 p.m. the *Newport* joined up with the leading ships which had anchored in Lake Timsah.

Nares next commanded the *Shearwater* on the same station, and a survey from Suez to Koseir was completed by April, 1872. On the voyage from England the *Shearwater* embarked Dr. W. B. Carpenter to assist, on behalf of the Royal Society, in an investigation of the Gibraltar current. This work was so well done as to mark Nares out for other scientific work, and when in 1872 the Government decided to commission a ship for exploration of the oceanic basins of the world, he was selected by the Admiralty to command the expedition, and was ordered home to prepare the *Challenger* for the cruise. The results of this expedition have been published, and it is only necessary to say here, that to the energy, tact, constant care, and watchfulness shown by Captain Nares, were due the initiation and success of work in the carrying out of which very few on board had any experience, and also the happy relations which existed throughout the voyage between the naval and scientific staffs on board.

Nares' qualities as a sailor were shown in a marked degree during this voyage, most of which, except when actually sounding and dredging, was carried out under sail; and they were especially conspicuous when the *Challenger* proceeded to the south from the Cape of Good Hope, across the Antarctic Circle, and all on board had an opportunity of appreciating his skill in handling the vessel amongst icebergs. Gales and snowstorms were not infrequent, and, the ship not having been strengthened for ice navigation, there were one or two occasions when quick decision was necessary, and was forthcoming.

The *Challenger* reached Hong Kong towards the end of 1874, when Nares bade farewell to that ship, having been recalled to England to head an expedition to the Polar sea. He was the youngest survivor of the officers who had gained Arctic experience in the expeditions sent by Government in search of Sir John Franklin. On this account, and because of his reputation as a fine seaman, and the ability with which he had conducted the work in the *Challenger*, he was selected for the command. The two ships employed were the *Alert* and *Discovery*, and the primary object of the expedition was, if possible, to reach the North Pole.

Leaving England on May 29, 1875, the vessels proceeded through Davis strait to Smith sound, where, a secure harbour having been found in 81° 44′ N., the *Discovery* was left to form a base of retreat, and the *Alert* pushed northward as far as possible to 82° 27′ N., and was there secured inside grounded floe bergs off the coast of the Polar sea, September 1, 1875.

Throughout the preparation of the expedition and the successful voyage of the two ships from England to their winter quarters, the old energy, zeal, and thoroughness which had characterized Nares' whole career were more than ever prominent; nothing was forgotten, nothing was overlooked, and both before the start and later on, with infinite patience and friendly tact, he brought the officers of the two ships to understand, by his personal example and leading, what were the principles of ice navigation in the narrow waters of Smith sound. No two ships have ever been so far north in company and returned undamaged to the port they sailed from.

On his return from the Arctic, Captain Nares was made a K.C.B. by Her Majesty Queen Victoria in recognition of his services, and he received the Gold Medal of the Society at a special meeting held in St. James' Hall. The account which he there gave of the work done by the expedition was more fully described in the 'Voyage to the Polar Sea,' which he wrote, and which is, as he says in the

Preface, "a plain and faithful account of the voyage of H.M. ships *Alert* and *Discovery* to and from the Polar sea." He was, in fact, himself a plain man in his modesty, in his quiet reserved nature and lack of fluency in speech, but he was essentially a man of action, of clear thought and quick decision, indefatigable, and unsparing of himself when work had to be done. His superiors deemed him a man of sound sense and good judgment, and those who served under him loved him for his equable temper, patience, and thoughtfulness, believed in him, and trusted him in all things.

He was buried at Long Ditton on January 19, 1915. The funeral was attended by Captain T. F. Parry, R.N., the hydrographer, representing the Admiralty, and by the following officers, all of whom had served under him in the Arctic: Admirals Sir Albert Hastings Markham, Sir Lewis Beaumont—who represented the Society—Sir Henry Stephenson, Pelham Aldrich, and George A. Giffard, and many naval officers and others who appreciated his sterling worth.

Captain W. H. I. Shakespear, C.I.E.

The Public Service has sustained a severe loss by the death of Captain W. H. I. Shakespear, C.I.E., who was killed in action on January 24. The deceased was a most promising officer, and was known to geographers for his recent adventurous journey across northern Arabia (*Journal*, vol. **44**, p. 96), when returning to this country on furlough from his post as British Resident at Koweit, on the Persian gulf. It was hoped that Captain Shakespear would describe this journey to the Society early in the present session, but this was prevented by his recall to his post shortly after the outbreak of the war. Captain Shakespear was the eldest son of Mr. W. H. S. Shakespear, formerly of the Indian Forest Service. He entered the army in 1898, but after a few years joined the Consular Service, becoming in turn Consul at Bandar Abbas and at Muskat, and subsequently Consul and Assistant to the Political Resident in the Persian gulf.

Dr. John Muir.

The well-known naturalist-traveller and glaciologist, Dr. John Muir, died last year at Los Angeles, California, in his seventy-sixth year. Born at Dunbar in Scotland in 1838, he went to the United States with his parents at an early age, and, after studying at the University of Wisconsin, gave play to his love of wild nature by travelling in many of the remoter parts of the United States. Eventually he joined the United States Coast and Geodetic Survey and began his acquaintance with Alaska, with the exploration of which his name will chiefly be associated by geographers. It has fittingly been given to the largest of the glaciers debouching on Glacier bay, Alaska, the main trunk of which has a width of some 25 miles. In 1881 he took part in the Arctic cruise of the U.S. revenue cutter *Corwin*, in search of the ill-fated *Jeannette*, and so extended his knowledge of the glacial conditions of the far north, which he described in a section of the official report of the voyage. He also supplied the "Botanical Notes on Alaska" included in the same report—an indication of the wide range of his interests. Much later (1899) he was one of the scientists who accepted the invitation of Mr. Harriman to accompany him on his expedition to Alaska, his special study being again the vast glaciers of that country, on which he supplied a memoir for incorporation into the general narrative of the expedition. Muir's love of nature and natural scenery made him an enthusiastic champion of the preservation of natural monuments in

the United States, especially in California, in which state he resided for many years, and whose magnificent mountains exercised on him a potent attraction. They were sympathetically described by him in his 'Mountains of California,' published in 1894.

CORRESPONDENCE.

"Cartographic Needs of Physical Geography."

MANY will have read with interest the account of Mr. Ogilvie's address on "Cartographic Needs of Physical Geography," published in the *Journal* for January. Doubtless most will regard his full scheme as at present impossible owing to expense, but it is none the less valuable, for we make better progress when we have ideals at which to aim. Part of his scheme, at any rate, is within the range of practical accomplishment. On p. 47 he refers to the fact that the teaching of land-forms is hampered owing to the high price of official maps. It is a difficulty which many schoolmasters have felt. It is true that schools can obtain Ordnance Survey maps at reduced rates by taking large quantities of the same sheet, but these are so bad because of inferior printing, or shoddy paper, or absence of colour, or for all reasons combined, that they are next to impossible to use, and I can only conceive of them producing violent distaste and boredom in the youthful mind. I know of more than one school where these sheets have been tried and abandoned. Moreover, these "home study" sheets are only part of what is needed. Mr. Ogilvie suggests an atlas containing parts of Ordnance Survey sheets illustrative of types of land-forms similar, in fact, to the fine atlas of such topographic maps published in the United States a year or two ago. It would, of course, contain far fewer maps, at any rate at first, so that it could be within financial reach of the classroom; it should be "printed in colours." The best instruction is on the ground; the next best is on good maps. The impression from the map is more vivid, the picture more true, the results wider and more lasting, the *educational* value far and away greater than anything that can be obtained from books or verbal description. Is it too much to hope, therefore, that the influence of the R.G.S. will be brought to bear on one step forward to Mr. Ogilvie's goal?

C. C. CARTER.

Marlborough College, Wilts.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1914–1915.

Seventh Meeting, February 8, 1915.—DOUGLAS W. FRESHFIELD, Esq., President, in the Chair.

ELECTIONS.—*Charles Camsell; Dr. A. J. Chalmors; Dillon Coste; Herbert Jones; Arthur Lee Knight; Charles Monroe Lincoln; Rev. William Paxton; Leslie F. Taylor.*

THE SOCIETY AND THE WAR.

The PRESIDENT spoke as follows: We have had several excellent and instructive lectures lately from Professors, dealing with questions connected with the war, and

particularly with the delimitation of European frontiers. Now, it is certain that in a relatively near future the delimitation of frontiers will have to be considered, not only in Europe, of which we have been talking lately, but all over the world. I for one must refuse to admit for a moment that in this settlement the Allies will not have a determining voice. I think it would be ridiculous to doubt it, remembering that the four great Powers engaged have all declared they do not mean to stop the war until they can have that determining voice. But it is surely very desirable that before this great task is thrown on diplomatists, the public mind should be informed as far as possible of what are the conditions, the geographical conditions, the racial and social and commercial conditions, the conditions of future development of railroads and waterways, which ought to influence the instructions to be given to our delegates at any Peace Congress. With this aim in view it has been arranged that we should have in our present session lectures and discussions treating generally of large areas in the Pacific and Africa. To-night we are going to hear a lecture dealing with the details of his late journeys in Persia from Colonel Sykes. But on this day fortnight a lecture will be given on the general aspects of the Pacific by Sir Everard im Thurn; and two days afterwards, on Wednesday, the 24th of this month, we are going to have a lecture from Sir Harry Johnston on the Future of Africa.

To some persons it may seem to be premature to discuss the future. To any such I am content in reply to point out the result of not being premature as illustrated by certain recent experiences. We had reason to know—it is proved by a recent publication of the Foreign Office—that there was the strongest circumstantial evidence in the development of frontier railroads that Belgium was likely to be invaded by Germany, yet, unfortunately, we took no precautions to provide a force adequate to fulfil our pledge and defend Belgium. The consequences have been indescribably lamentable. There is a case of not being premature. I might quote other recent cases hardly less unfortunate.

Our friend Mr. Roosevelt uses a very good phrase when he talks of the "Apostles of Unreadiness." There is some truth in the proverb that "Premature is the watch-word of the Purblind."

For these reasons I cannot think it out of place for this the first Geographical Society of the Empire to press on our statesmen and the public the importance of obtaining some clear realization of the facts, and some clear conception of the broad principles, by which we and our allies should be influenced in the rearrangement of frontiers outside Europe—when the time comes for such a rearrangement. Unless these matters are considered beforehand it will be difficult, if not impossible, to give clear and adequate instructions to our delegates at a Peace Congress, such instructions as may enable them not only to maintain our own proposals, but to criticize the alternative proposals sure to be put forward.

Changes in political geography there must be in the future interests of our Empire and of the peace of the world. These may be rectifications, or exchanges, between friends, as well as forfeits by the enemy. I should be sorry, were it inferred that any territorial ambition, any earth-hunger, underlay these suggestions. Germany has played for the Empire of the world, and in doing so has lost her own soul. But we hope there may be a day when she may regain it and free herself from Prussian militarism. Then we shall not grudge her a place in the sun; only she must not ask the other nations to sit in her shadow. Our general aim should be peace and, as far as possible, goodwill in the future for all concerned.

The paper read was:—

"A Seventh Journey in Persia." By Colonel P. Molesworth Sykes, C.M.G., C.I.E.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are as a rule written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Gen. = Genootschap.
Ges. = Gesellschaft.
I. = Institute, Institution.
Int. = International.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.(k.) = kaiserlich (und königlich).
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps—Historical. *Jb. Schweizer Alpenclub* **49**, 1913 (1914): 157–169. **Weber.**
Die Bedeutung des Pilatus in der Alpenkunde. Von P. X. Weber. *Illustrations.*

Alps—Morphology. *Jb. Schweizer Alpenclub* **49**, 1913 (1914): 214–234. **Ludwig.**
Terrassen, Stufen und Talverzweigung in den Alpen. Von A. Ludwig. *Illustrations.*

Carpathians. *Jb. Schweizer Alpenclub* **49**, 1913 (1914): 108–127. **Täuber.**
Wanderungen in den Karpathen. Von C. Täuber. *Illustrations.*

Europe—Geography. **Philip.**
Philips' Model Geography. The soldier's geography of Europe. 5th edition. London: George Philip & Son, [1915]. Size 7½ × 5, pp. 96. *Maps and Illustrations. Price* 3*d. net. Presented.*

Europe—Oysters. *Ymer*, 1914: 214–240. **Hillman.**
Ostronets förekomst, odling och tillgodogörande i Europa. En ekonomisk geografisk studie. Af Adolf F. Hillman. *Sketch-maps and Illustrations.*

Europe—Political. *National G. Mag.* **26** (1914): 191–192. ——
Map of Europe, including the New Balkan States.
The letterpress gives statistics of the States of Europe, and the map (size 18 × 22 inches) shows the Balkan boundaries in 1914.

France—Isère. *Recueil Travaux I.G. Alpine* (*Grenoble*) **2** (1914): 299–334. **Allix.**
La foire de Goncelin. Par A. Allix. *Sketch-maps.*

France—Isère. *Recueil Travaux I.G. Alpine* (*Grenoble*) **2** (1914): 335–351. **Marchal.**
Uriage, étude géographique d'une station balnéaire. Par J. Marchal.

France—Isère valley. **Blache.**
Recueil Travaux I.G. Alpine (*Grenoble*) **2** (1914): 353–407.
Le bord d'auge glaciaire du Grésivaudan (rive gauche): étude de morphologie glaciaire. Par J. Blache. *Sketch-maps, Diagrams, and Illustrations.*
On the features due to glaciation,

France—Language. **Passy.**

A French phonetic reader. By Paul Passy. London: University of London Press, 1914. Size 7½ × 5, pp. viii. and 42. *Price 2s. net. Presented.*

Germany—Language. **Egan.**

A German phonetic reader. By Alfred Egan. London: University of London Press, 1913. Size 7½ × 5, pp. xvi. and 142. *Price 5s. net. Presented.*

Hungary. *National G. Mag.* **26** (1914): 311–393. **Townley-Fullam.**

Hungary: a Land of Shepherd Kings. By C. Townley-Fullam. *Map and Illustrations.*

Iceland—Guide. *Aarbog Nordisk Oldkyndighed, III.*, **3** (1913): 50–105. **Kålund.**

En islandsk Vejviser for Pilgrimme fra 12 Århundrede. Ved Kr. Kålund.

Italy—Atlas. *La G., I. G. de Agostini* **2** (1914): 202–218. **Gortani and Toniolo.**

Per un "Atlante del paesaggio geografico italiano." By M. Gortani and A. R. Toniolo.

Italy—Early cartography. *Riv. G. Italiana* **21** (1914): 640–656. **Almagià.**

La cartografia dell' Italia nel Cinquecento, con un saggio sulla cartografia del Piemonte. By Roberto Almagià.

Italy—Tuscany. *Riv. G. Italiana* **21** (1914): 657–667. **Stefanini.**

Sulle "biancane" del Volterrano e del Senese. By G. Stefanini. *Illustrations.*

On a curious morphological feature consisting of a labyrinth of small mounds and cones formed in a clayey or marly soil.

Italy—Vesuvius. *B.R.S.G. (Rome) V.* **3** (1914): 753–805. **Malladra.**

Nel cratere del Vesuvio. By Alessandro Malladra. *Illustrations.*

Describes the conditions of the past two years in the crater of Vesuvius, illustrating them by a large number of photographs.

Portugal. **Hargrove.**

Progressive Portugal. By Ethel C. Hargrove. London: T. W. Laurie, Ltd., [1914]. Size 7½ × 5, pp. 276. *Map and Illustrations. Price 6s. net. Presented.*

Switzerland—Mountaineering. **Abraham.**

Swiss Mountain Climbs. By George D. Abraham. London: Mills & Boon, [1912]. Size 7 × 4½, pp. xvi. and 432. *Diagrams and Illustrations. Price 5s.*

ASIA.

Arabia. *B.S. Neuchateloise G.* **23** (1914): 1–252. **Cart.**

Au Sinaï et dans l'Arabie Pétrée. Par Léon Cart. *Maps and Illustrations.*

China—Language. **Jones and Woo.**

A Cantonese phonetic reader. By Daniel Jones and Kwing Tong Woo. London: University of London Press, [1912]. Size 7½ × 5, pp. x. and 96. *Price 5s. net. Presented.*

Eastern sketches. **Claudel.**

The East I know. By Paul Claudel. Translated by Teresa Frances and William Rose Benét. London: Humphrey Milford, 1914. Size 8 × 4½, pp. xiv. and 200. *Price 5s. 6d. net. Presented.*

India—Bengal—Cartography. **Hirst and Ascoli.**

A memoir upon the maps of Bengal constructed from 1764 onwards by Major James Rennell, F.R.S. In explanation of Rennell's Atlas of 1779; that of 1781; and a Companion Atlas of 1914 which contains those remnants of Rennell's work not published previously. By Major F. C. Hirst; with a chapter upon the legal value of Rennell's maps by F. D. Ascoli. Calcutta, 1914. Size 13 × 8, pp. ii. and 29. *Price Re.*1–2 (1*s.* 9*d.*).

The atlas of 1914 has not yet been received.

India—Cotton. *J. East India Assoc.*, N.S. **6** (1915): 1–54. **Summers.**

Development of Cotton in India: Sind, a second Egypt. By T. Somers. *Map and Diagrams.*

India—Kashmir. **Parbury and others.**

The Emerald set with Pearls. Being reminiscences of the beautiful land of Kashmir, with illustrations from water-colour drawings by Florence Parbury.

Also Thomas Moore's "Lalla Rookh," with musical additions by Florence Parbury and Guido Zuccoli. London: Simpkin, Marshall & Co., N.D. Size 12 × 10, pp. 218 and 38. *Presented by Douglas Freshfield, Esq.*

India—Madras—Coast. **Spring.**

Min. of Proc. I. Civil Engineers **194** (1914): 153–246.

Coastal sand-travel near Madras Harbour. By Sir Francis Joseph Edward Spring. *Sketch-maps, Sections, and Diagrams.*

India—N.-E. Frontier. *R. Engineers J.* **21** (1915): 1–28. **Gunter.**

The Mishmi Mission Survey Detachment. By Captain C. P. Gunter.

India—Punjab—Language. **Bailey.**

A Panjabi phonetic reader. By T. Grahame Bailey. London: University of London Press, 1914. Size 7½ × 5, pp. xviii. and 40. *Price 2s. net. Presented.*

India—Rivers. *Records Geol. Survey of India* **44** (1914): 234–240. **Fermor.**

On the probable future beheading of the Son and Rer Rivers by the Hasdo. By L. Leigh Fermor. *Map and Illustrations.*

Malay Archipelago—Java. **McMillan.**

A journey to Java. By M. McMillan. London: Holden & Hardingham, [1914]. Size 9 × 5½, pp. x. and 286. *Illustrations. Presented.*

Russia—Caucasus. *Jb. Schweizer Alpenclub* **49**, 1913 (1914): 128–154. **Schibler.**

Eine Durchquerung des Kaukasus. Von W. Schibler. *Illustrations.*

Tibet—Kinthup's journey. **Oakes.**

Note in vindication of Kinthup. By Captain G. F. T. Oakes. (To be included in the *Records of the Survey of India* for 1913–14.) Dehra Dun, 1914. Size 10½ × 8½, pp. 5. *Portraits.*

See note in vol. **44**, p. 503.

Turkey—Babylon—Archæology. **Koldewey.**

The excavations at Babylon. By Robert Koldewey. Translated by Agnes S. Johns. London: Macmillan & Co., 1914. Size 10 × 6½, pp. xx. and 336. *Maps, Plans, and Illustrations. Price 21s. net.*

AFRICA.

Abyssinia. **Castro.**

Dr. Lincoln de Castro. Nella terra dei Negus. Pagine raccolte in Abissinia. 2 vols. Milan: Fratelli Treves, 1915. Size 10 × 6½, pp. (vol. 1) x. and 388; (vol. 2) 583. *Maps and Illustrations. Price 25s.*

An important work, by an Italian long resident in the country.

British East Africa—Kisumu. **Oswald.**

Alone in the Sleeping-sickness country. By Dr. Felix Oswald. London: Kegan Paul & Co., 1915. Size 9 × 5½, pp. xii. and 220. *Map and Illustrations. Price 8s. 6d. net. Presented.*

Egypt—Desert. *B.R.S.G. (Rome)*, V., **3** (1914): 727–745. **Cortese.**

Una escursione nel deserto arabico. By Emilio Cortese. *Illustrations.*

Morocco—Map. *B.R.S.G. (Madrid)* **56** (1914): 8 sheets. **Ardanuy.**

Mapa de la región S. O. de Marruecos al S. del rió Tensift, por el Teniente Coronel (retirado) de Estado Mayor D. Eduardo Alvarez Ardanuy, en escala de 1 : 150,000.

Morocco—Shawia. *B.S.G. d'Alger* **19** (1914): 38–72. **Tubert.**

La Chaouia. By P. Tubert.

North Africa—Boundaries. *B.S.G. d'Alger* **19** (1914): 14–20. ———

Délimitation de la Lybie.

Portuguese East Africa—Quillimane. **Durão.**

B.S.G. Lisboa, 1914 (1914): 32 Série: 139–189.

O distrito de Quelimane. Por A. de Portugal Durão.

Rhodesia—Guide. ———

Guide to Rhodesia for the use of tourists and settlers. First edition. Issued by authority of the Beira and Mashonaland and Rhodesia Railway. London: British S. Africa Comp., 1914. Size 6½ × 4½, pp. xvi. and 396. *Map, Plans, and Illustrations. Price 2s. net. Presented.*

Rhodesia—Geology. *T. Geol. S. South Africa* **17** (1914): 39–54. **Wagner.**
The Geology of a Portion of the Belingwe District of Southern Rhodesia. By P. A. Wagner. *Map, Plates, and Diagram.*
The area dealt with embraces the De Beers ranch, south of the Bulawayo-Gwelo railway, and its neighbourhood. Two of the plates represent ruins in this district.

Sahara—Bilma. *B.S.G. d'Alger* **19** (1914): 21–37. **Gardel.**
La Liaison avec Bilma. By Lieut. Gardel. *Map.*

Sahara—Borku. *S.G. Com. Paris, B. Mensuel* **36** (1914): 523–558. **Ferrandi.**
Description du Borkou méridional. By Jean Ferrandi. *Illustrations.*

South Africa—Ethnology. *J. African S.* **14** (1914): 24–34. **Mendelssohn.**
Judaic or Semitic Legends and Customs amongst South African Natives. By Sidney Mendelssohn.

South Africa—Place-names. *South African J. Sc.* **11**, 1914 (1915): 95–106. **Pettman.**
South Africa place-names. By Rev. C. Pettman.

South Africa—Whales. **Olsen.**
Bergens Museums Aarbok, 1914–1915 (1914): Nr. 5, pp. 50.
Hvaler og hvalfangst i Sydafrika. Av Ørjan Olsen. *Illustrations.*

South and East Africa—Guide. **Brown.**
The guide to South and East Africa . . . Edited annually by A. Samler Brown and G. Gordon Brown for the Union-Castle Mail S.S. Co. 1915. (21st edition.) London: S. Low & Co., [1915]. Size 7½ × 5, pp. liv. and 694. *Maps and Plans. Price* 1*s. net. Presented.*

Spanish Sahara. *B.R.S.G. (Madrid)* **56** (1914): 129–347. **d'Almonte.**
Ensayo de una breve descripción del Sáhara español. Por Enrique d'Almonte. *Sketch-maps and Illustrations, and Maps separate.*
The general map, in four sheets, is on the scale of 1 : 1,000,000.

Zanzibar—Agriculture. *B. Imperial I.* **12** (1914): 407–429. **McClellan.**
Agricultural resources of the Zanzibar Protectorate. By F. C. McClellan.

NORTH AMERICA.

Alaska—Glaciers. *Sc.* **41** (1914): 32–33. ——
First Exploration of an Alaskan Glacier.
Brief account of Miss Keen's expedition (*Journal*, January, 1915, p. 79, and *supra*, p. 251).

Bermuda. *American J. Sc.* **38** (1914): 189–206. **Pirsson.**
Geology of Bermuda Island; the igneous platform. By L. V. Pirsson. *Section and Diagrams.*

Canada—Boundaries. **Klotz.**
Boundaries of Canada. By Otto Klotz. Waterloo Historical Society, 1914. Size 9 × 6, pp. [13].

Canada—Historical. **Knox and Doughty.**
An historical journal of the campaigns in North America for the years 1757, 1758, 1759, and 1760. By Captain John Knox. Edited with introduction, appendix, and index by Arthur G. Doughty. Vol. 2. (Publ. Champlain Society, vol. 9.) Toronto, 1914. Size 10 × 6½, pp. x. and 618.

Canada—Hydrography. [**Hazen.**]
Report of the Department of the Naval Service for the fiscal year ending March 31, 1914. [Ottawa], 1914. Size 10 × 6½, pp. 95. *Maps and Illustrations. Price* 10 *cents.*

Canada—Quebec. **Departments of Lands and Forests.**
Report of the Minister of Lands and Forests of the Province of Quebec for the twelve months ending June 30, 1913. Dept. of Lands and Forests, Quebec, 1913. Size 10 × 7, pp. 155. *Illustrations.*

Newfoundland—Surveys. **Rupert-Jones.**
Hydrographic Ann. No. 2, 1913 (1914): 11–18.
An historical sketch of H.M. Newfoundland Survey, 1714–1912. By Lieut. J. A. Rupert-Jones. *Illustration.*

North America—Early Travels. **Douglas.**

Journal kept by David Douglas during his travels in North America, 1823–1827, together with a particular description of thirty-three species of American oaks and eighteen species of Pinus. Published under the direction of the Royal Horticultural Society. London: William Wesley & Son, 1914. Size 10 × 6, pp. 364. *Portrait.* *Price* 21*s.*

These interesting journals, by the well-known botanist traveller who gave his name to the Douglas fir, are now printed for the first time. The volume includes, as an appendix, an account of a visit to the Hawaiian volcanoes.

North America—Forestry. *Popular Sc. Monthly* **85** (1914): 338–361. **Harper.**

The coniferous forests of Eastern North America. By Dr. Roland M. Harper. *Illustrations.*

Rockies—Geology. **Daly.**

Geology of the North American Cordillera at the Forty-ninth Parallel. By Reginald Aldworth Daly. Part II. (Dept. of the Interior. Appendix 6. Report of the Chief Astronomer, 1910.) Ottawa, 1913. Size 10 × 6½, pp. xxvii. and 857. *Illustrations*; *Maps separate.*

United States—Arizona. **Noble.**

The Shinumo Quadrangle, Grand Canyon District, Arizona. By L. F. Noble. (U.S. Geol. Surv., Bulletin 549.) Washington, 1914. Size 9 × 6, pp. 100. *Maps and Illustrations.*

United States—Arizona. *American J. Sc.* **38** (1914): 491–501. **Gregory.**

A Reconnaissance of a portion of the Little Colorado valley, Arizona. By Herbert E. Gregory. *Illustrations.*

United States—California. **Wood.**

The tourists' California. By Ruth Kedzie Wood. New York: Dodd, Mead, and Comp., 1914. Size 7½ × 5, pp. 396. *Map and Illustrations.* *Price* 5*s.* 6*d. net. Presented.*

United States—California—Lassen peak. **Diller.**

B. Seismolog. S. America **4** (1914): 103–107.

The Eruptions of Lassen Peak, California. By J. S. Diller. *Illustrations.*

Cf. note in vol. **44,** p. 505.

United States—Cape Cod Canal. *National G. Mag.* **26** (1914): 185–190. **Miller.**

The Cape Cod Canal. By J. W. Miller. *Sketch-maps and Illustrations.*

See note in the January number, p. 79.

United States—Colorado river. *National G. Mag.* **26** (1914): 99–184. **Kolb.**

Experiences in the Grand Canyon. By Ellsworth and Mary Kolb. *Illustrations and Sketch-map.*

United States—Columbia river. **Marshall.**

Profile Surveys in the Basin of Clark Fork of Columbia river, Montana-Idaho-Washington. Prepared under the direction of R. B. Marshall. (U.S. Geol. Surv., Water Supply Paper 346.) Washington, 1914. Size 10 × 6, pp. 6. *Maps and Sections.*

There are twenty-two sheets of maps and profiles.

United States—Eastern Seaboard. *Science* **40** (1914): 881–883. **Bigelow.**

Oceanographic Cruise of the Schooner *Grampus.* By Henry B. Bigelow.

See note in the Monthly Record, *supra*, p. 250.

United States—Expansion. **Department of the Interior.**

Areas of Acquisitions to the Territory of the United States. Areas of the States, Territories and Possessions, Diagram showing the Historical Development of the States. Department of the Interior, Washington, 1914. Size 9 × 6, *folding diagram.* *Price* 15 *cents.*

United States—Geological History. *Science* **40** (1914): 827–830. **Jones.**

The Geologic History of Lake Lahontan. By J. Claude Jones.

United States—Mississippi—Fisheries. **Coker.**

Water-Power Development in relation to Fishes and Mussels of the Mississippi. By Robert E. Coker. (Appendix VIII. to the Report of the U.S. Commissioner of

Fisheries for 1913. Bureau of Fisheries Doct. No. 805.) Washington, 1914. Size 9 × 6, pp. 28. *Illustrations.*

United States—New York—Finger Lakes. **Birge and Juday.**

A Limnological Study of the Finger Lakes of New York. By Edward A. Birge and Chancey Juday. (From *Bulletin* of the Bureau of Fisheries, vol. 32, 1912, pp. 528–609.) Washington, 1914. *Maps and Diagrams.*

United States—Pacific Coast. *Science* 41 (1915): 48–57. **Diller.**

The Relief of our Pacific Coast. By J. S. Diller.

United States—Rainfall. *Scottish G. Mag.* 30 (1914): 582–595. **Wallis.**

The distribution of rainfall in the North-Eastern United States: its causes and results. By B. C. Wallis. *Sketch-maps and Diagram.*

United States—Snowfall. *Monthly Weather Rev.* 42 (1914): 318–330. **Brooks.**

Distribution of snowfall in cyclones of the eastern United States. By Charles F. Brooks. *Maps.*

United States—South Carolina—Earthquakes. **Taber.**
B. Seismolog. S. America 4 (1914): 108–160.

Seismic Activity in the Atlantic Coastal Plain near Charleston, S.C. By Stephen Taber. *Sketch-maps, Diagrams, and Illustrations.*

United States—Washington—Mt. Rainier. *Masama* 4 (1914): 10–13. **Prouty.**

Mount Rainier. By H. H. Prouty. *Illustrations.*

CENTRAL AND SOUTH AMERICA.

Argentine and Chile—Railway. **Henderson.**
Min. of P.I. Civil Engineers 195 (1914): 151–212.

The Transandine railway. By Brodie Haldane Henderson. *Diagrams and Sections.*

Bolivia—Administrative. **Ballivián and Pinilla.**
B. Dirección Gen. Estadística, etc. (*Bolivia*), No. 89 (1914): 193–294.

División Política de la República. Por Manuel V. Ballivián y Casto F. Pinilla.

Bolivia—Omasuyu. **Paredes.**

La Altiplanicie. Descripcion de la Provincia Omasuyu. Por Rigoberto Paredes. La Paz, 1914. Size 10 × 6½, pp. 73.

Brazil—Lower Amazon. **Lange.**

The Lower Amazon. By Algot Lange. With an Introduction by Frederick S. Dellenbaugh. London: G. P. Putnam's Sons, 1914. Size 8½ × 5½, pp. xxvi. and 460. *Map and Illustrations. Price* 10*s.* 6*d. net. Presented.*

A new work by the author of 'In the Amazon Jungle' (cf. *Journal*, vol. 40, p. 635).

Colombia—Political. **Thomson.**

Colombia and the United States. (First edition.) A juridical study of another "Scrap of Paper" and its supersession by the Colombian indemnity treaty for the settlement of the Panama question. By Norman Thomson. London: N. Thomson & Co., [1915]. Size 7½ × 5, pp. xxiv. and 176. *Price* 1*s. net. Presented.*

Colombia—Scientific Expedition. **Fuhrmann and Mayor.**

Dr. O. Fuhrmann et Dr. Eug. Mayor. Voyage d'exploration scientifique en Colombie. Vol. 5 des "Mémoires de la Société neuchâteloise des Sciences naturelles." Neuchâtel: Attinger Frères, 1914. Size 11½ × 9, pp. 1090. *Map and Illustrations. Price* 48*s. net.*

This Swiss expedition, which set out in 1910, was referred to in vol. 35, p. 198. The present publication opens with a narrative of the journey, but is mainly concerned with the scientific results (botanical and zoological, etc.); a section treats of determinations of altitude.

Falkland Isles—Whales. **Salvesen.**

Scottish National Antarctic Expedition. The Whale Fisheries of the Falkland Islands and Dependencies. By Theodore E. Salvesen. (Reprinted from 'Report on the Scientific Results of the Scottish National Antarctic Expedition,' vol. 4, pp. 475–486.) Edinburgh, 1914. Size 12 × 9½. *Price* 3*s. Illustrations and Sketch-map.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. **Gullett.**

The opportunity in Australia. By H. S. Gullett. With an Introduction by Lord Chelmsford. London: Horace Cox, [1914]. Size 8½ × 5½, pp. xviii. and 150. *Illustrations. Price* 3*s.* 6*d. net.*

Valuable for the intending settler and others interested in the economic development of Australia.

Australia—Desert sounds. *Rep. Australian Ass.* **14** (1913): 352–361. **Gill.**

Phenomenal sounds in the interior of Australia—are they terrestrial or atmospherical? By Thomas Gill.

See note in the Monthly Record, *supra*, p. 251.

Cocos-Keeling islands—Fauna. **Wood-Jones.**

Nature's Colonists. By Frederic Wood-Jones. (Reprinted from the *London Hospital Gazette*, 1909. *Sketch-map.*

New Guinea—Ethnology. *P.R.I.* **20** (1914): 765–775. **Rawling.**

The Pygmies of New Guinea. By Captain Cecil G. Rawling.

New South Wales—Geology. **Süssmilch.**

An introduction to the geology of New South Wales. By C. A. Süssmilch. 2nd edit., revised and enlarged. Sydney: Angus & Robertson, 1914. Size 7½ × 5, pp. xviii. and 270. *Sketch-map, Sections, and Illustrations. Price* 7*s.* 6*d. net.*

Pacific islands. **Friederici.**

Malaio-Polynesische Wanderungen. Von Dr. Georg Friederici. (Vortrag gehalten auf dem XIX. Deutschen Geographentage zu Strassburg i. E. 4 Juni 1914.) Leipzig, 1914. Size 9½ × 6, pp. 38.

Pacific—Ocean island, etc. *Nautical Mag.* **93** (1915): 22–28. **Erskine.**

The Richest Island in the Pacific. By — Erskine.

Ocean island has been found to consist of almost pure phosphate of lime.

Queensland—Coal Resources. **Dunstan.**

Coal Resources of Queensland (a General Review). (Queensland Geol. Surv., Publ. No. 239.) Brisbane, 1913. Size 10 × 6, pp. 29.

See note in the Monthly Record, February.

South Australia—Geology. *Rep. Australasian Ass.* **14** (1913): 148–178. **Howchin.**

The evolution of the physiographical features of South Australia. By Walter Howchin. *Sketch-map and Sections.*

Torres Strait. *Popular Sc. Monthly* **85** (1914): 209–231. **Mayer.**

An Expedition to the Coral Reefs of Torres Straits. By Dr. Alfred Goldsborough Mayer. *Sketch-maps.*

See note in the January number, p. 80.

Victoria—Discovery. *Rep. Australasian Ass.* **14** (1913): 343–351. **Fowler.**

Notes on the discovery of the Victorian coast-line. By Thomas Walker Fowler.

Victoria—Geology. **Herman.**

Economic Geology and Mineral Resources of Victoria. By H. Herman. (Bulletin of the Geological Survey of Victoria, No. 34.) [Reprinted from 'Handbook to Victoria, British Association for the Advancement of Science, Australian Meeting, 1914.] Melbourne, 1914. Size 9½ × 6, pp. 36. *Maps and Illustrations. Price* 1*s.*

Western Australia—Monte Bello islands. **Montague.**

P. Zool. S., 1914 (1914): 625–652.

A Report on the Fauna of the Monte Bello Islands. By P. D. Montague. *Plates.*

Mr. Montague gave an account of these islands in the *Journal*, vol. **42**, p. 34.

POLAR REGIONS.

Antarctic—Australasian Expedition. **Mawson.**

The Home of the Blizzard. Being the story of the Australasian Expedition, 1911–14. By Sir Douglas Mawson, D.SC., B.E. 2 vols. London: Wm. Heinemann,

1915. Size 10 × 7, pp. (vol. 1) xxx. and 350; (vol. 2) xiv. and 338. *Maps and Illustrations. Price* 36*s. net. Presented.*

Arctic—Early voyages. **Naber.**

Reizen van Jan Huyghen van Linschoten naar het Noorden (1594–1595). Uitgegeven door S. P. l'Honoré Naber. (Werken uitgegeven door de Linschoten-Vereeniging, 8.) The Hague: M. Nijhoff, 1914. Size 10 × 6½, pp. lxxxiv. and 308. *Map and facsimiles.*

A welcome reprint of this rare narrative of Barents' Arctic voyages.

Arctic—Greenland—Godthaab. *Ymer* **1914** (1914): 189–213. **Klinckowström.**

En sommar i Godthaabsnejden. Af Axel Klinckowström. *Illustrations.*

Arctic—Spitsbergen. *Scottish G. Mag.* **31** (1915): 1–22. **Isachsen.**

Green Harbour, Spitsbergen. By Gunnar Isachsen. *Sketch-map and Illustrations.*

MATHEMATICAL GEOGRAPHY.

Cartography. **Partsch.**

Die Internationale Weltkarte in 1 : 1,000,000. Ein Rückblick—ein Ausblick. Von J. Partsch. (Sonderabdruck aus den "Mitteilungen der Gesellschaft für Erdkunde" zu Leipzig, 1913, pp. 19.)

Orientation. **Tilney.**

Marching or flying by night without a compass, with time-table of direction stars for use in the British Isles, January 1 to December 31, 1913–1918, latitudes 40° N. to 55° N. By Lieut.-Col. W. A. Tilney. London: Hugh Rees, 1914. Size 5½ × 3½, pp. [60]. *Plan and Charts. Price* 2*s.*

Tables. *Smithsonian Misc. Coll.* **63** (1914): No. 6, pp. xxxvi. and 356. **Fowle.**

Smithsonian physical tables, 6th revised edit. Prepared by Frederick E. Fowle.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. **Pettersson.**

Climatic variations in historic and prehistoric time. By O. Pettersson. (Ur Svenska Hydrografisk-Biologiska Kommissionens Skrifter, Häft. V.) Göteborg, [1914]. Size 19 × 12½, pp. 26. *Map, Sketch-map, Illustrations, and Diagrams.*

Geomorphology—Coasts. *Ymer*, 1914: 241–270. **Ahlmann.**

Strandzonens allmänna morfologiska utveckling med särskild hänsyn till insjöar. Af Hans W:son Ahlmann. *Illustrations.*

On the morphological development of coast zones.

Geophysics. **Pettersson.**

On the occurrence of lunar periods in solar activity and the climate of the Earth. A study in geophysics and cosmic physics. By O. Pettersson. (Ur Svenska Hydrografisk-Biologiska Kommissionens Skrifter, Häft V.) Göteburg, [1914]. Size 19 × 12½, pp. 20. *Diagrams.*

Icebergs. *P.R.I.* **20** (1914): 523–542. **Barnes.**

Icebergs and their Location in Navigation. By Howard T. Barnes. *Illustrations.*

Landslides. *La G.* (*I.G. de Agostini*) **2** (1914): 218–226. **Almagià.**

Le frane e il loro studio dal punto di vista geografico. By Roberto Almagià.

Meteorology. **Danish Meteorological Institute.**

Monthly Meteorological Data for ten-degree squares in the Atlantic and Indian Oceans. Computed by the Royal Netherlands Meteorological Institute from Swedish and Dutch observations 1900–1912, and from international observations January–June, 1913. (Koninklijk Nederlandsch Meteorologisch Institut. No. 107A.) Utrecht: Kemink & Zoon, 1914. Size 12½ × 9½, pp. iv. and 24.

Physical geography—Text-book. **Lake**

Physical geography. By Philip Lake. Cambridge: University Press, 1915. Size 9 × 5½, pp. xx. and 324. *Diagrams, Sections, and Illustrations. Price* 7*s.* 6*d. net. Presented.*

BIOGRAPHY.

Flinders. **Scott.**

The life of Captain Matthew Flinders, R.N. By Ernest Scott. Sydney: Angus & Robertson, 1914. Size 9 × 5½, pp. xviii. and 492. *Maps and Illustrations. Price* 21*s.*

GENERAL.

Bibliography. **Fordham.**

Studies in Carto-Bibliography, British and French, and in the bibliography of itineraries and road-books. By Sir Herbert George Fordham. Oxford: Clarendon Press, 1914. Size 9 × 6, pp. 180. *Price* 6*s. net. Presented.*

Commercial—Waterways. **Hepburn.**

Artificial waterways of the world. By A. Barton Hepburn. New York: Macmillan Company, 1914. Size 8 × 5, pp. viii. and 172. *Illustrations. Price* 5*s.* 6*d. net. Presented.*

The title is somewhat misleading, as the greater part of the book deals with canals in the Eastern United States.

Eastern travel. **Thompson.**

A Pilgrim's Scrip. By R. Campbell Thompson. London: J. Lane, 1915. Size 9 × 5½, pp. 346. *Map and Illustrations. Price* 12*s.* 6*d. net. Presented.*

Experiences during journeys of archæological research in Asiatic Turkey, with a chapter on the Sudan.

Education. *Scottish G. Mag.* **31** (1915): 23–34. **Mackie.**

The Study of Land-Forms in the School. By G. B. Mackie. *Sketches and Diagrams.*

Education—Maps. **Myres and others.**

Rept. Brit. Ass., Birmingham, 1913 (1914): 156–161.

Atlas, Textual and Wall maps for School and University use. Report of the Committee, consisting of Prof. J. L. Myres and others, appointed to inquire into the choice and style thereof. *Diagram.*

Geography. *B. American G.S.* **46** (1914): 801–816. **Roorbach.**

The Trend of Modern Geography. A Symposium, conducted by G. B. Roorbach.

Gives the results of inquiries addressed to a number of leading geographers, as to the main tasks of present-day geography.

History of navigation. **Bensaude.**

Histoire de la science nautique Portugaise à l'époque des grandes découvertes. Collection de documents publiés par ordre du Ministère de l'Instruction Publique de la République Portugaise. Par Joaquim Bensaude. Vol. 1. Munich: Carl Kuhn, 1914. Size 11 × 7½, pp. 64. *Facsimiles. Presented.*

Miscellanea. **Santarem and Freitas.**

2° Visconde de Santarem. Inéditos (Miscellanea) colligidos, coordenados e annotados por Jordão de Freitas, e trazidos á publicidade pelo 3° Visconde de Santarem. Lisbon, 1914. Size 11 × 8, pp. 582.

Historical memoirs and jottings on a variety of subjects, many referring to the history of voyages and geography.

Nautical terms. **Delbos.**

Nautical terms in English and French and French and English. By Leon Delbos. New and cheaper edition. London: Williams & Norgate, 1914. Size 7½ × 5, pp. xiv. and 462. *Illustrations. Price* 5*s.*

A new and revised edition of this useful work.

Voyage. **Du Baty.**

15,000 miles in a Ketch. By Captain Raymond Rallier du Baty. London: T. Nelson & Sons, [1915]. Size 6½ × 4½, pp. 374. *Price* 1*s. net. Presented.*

The author is known for his surveys of Kerguelen island (*cf. Journal*, vol. 39, p. 618).

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

ASIA.

Malay Peninsula. **F.M.S. Survey Dept.**

General map of Straits Settlements, Federated and Protected Malay States. (Provisional issue.) Scale 1 : 760,320 or 1 inch to 12 stat. miles. 2 sheets, each 18 by 31 inches. Kuala Lumpur: Federated Malay States Survey Department, 1913. *Presented by the Surveyor-General of the Federated Malay States.*

A useful general map, printed in colours, compiled from the trigonometrical, revenue, and topographical surveys of the Federated Malay States and Straits Settlements; topographical survey by the colonial survey section, Anglo-Siamese Boundary Commission; information supplied by the superintendents of surveys of Kedah, Johore, and Kelantan, and by the general manager Federal Malay States railways; Admiralty charts; and reconnaissance surveys by Mr. H. Berkeley in Upper Perak, Mr. N. T. Gray in Pahang, and Mr. W. Dunman in Trengganu, and by others. Relief is represented by brown shading, with heights in figures. The map also shows railways open, under construction, and proposed; roads metalled and unmetalled; paths; state and district boundaries, and other information. No attempt has been made to overcrowd the map, and in certain districts it is rather remarkably bare considering the amount of detail that is to be found in the same parts on other maps. However, much of this is perhaps of doubtful reliability.

Federated Malay States. **Surveyor-General, F.M.S.**

Topographical Survey of the Federated Malay States. Scale 1 : 63,360 or 1 inch to 1 stat. mile. Sheets: 3 F–8, Seremban; 3 F–12, Pasir Panjang. 1913. Size 18 by 19 inches. *Price* $2.50 *each sheet.* Scale 1 : 31,680 or 2 inches to 1 stat. mile. Sheet: Seremban and environs. 1912. Size 10 by 10 inches. Kuala Lumpur: Central Survey Office. *Presented by the Surveyor-General, Federated Malay States.*

Additional sheets of the new Federated Malay States Survey which was noticed in the *Geographical Journal* for February, 1914. Sheet No. 3 F–8 comes above No. 3 F–12, and together they include the coast country immediately to the north of the boundary of Malacca. Each sheet comprises 15′ of latitude and longitude. Seremban and environs is given as a separate sheet, on twice the scale of the others.

All the sheets are well produced and printed in colours. Relief is shown by contours in brown at 50-feet intervals, and "spot" heights are in figures, with a letter indicating how the height has been obtained. Information concerning the progress of this survey is given every year in the Annual Report of the Colonial Survey Committee.

Malay Peninsula. **Jackson.**

Anglo-Siamese Boundary Commission. Map showing the boundary-line between the Kingdom of Siam and the Malay States under British Protection, as surveyed, agreed to, and beaconed by the Joint Commission appointed under the Treaty of 1909, 1910–1912. Compiled under the direction of Colonel H. M. Jackson, R.E. (Retd.), British Commissioner for the Delimination. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Size 27 by 48 inches. Kuala Lumpur: F.M.S. Central Survey Office, [1913]. *Presented by the Surveyor-General, Federated Malay States.*

Shows the boundary-line across the peninsula and the country on either side for about 5 miles, from surveys of the Anglo-Siamese Boundary Commission. The boundary is in a black pecked line, ferm lines are in brown at approximately 100 metres vertical intervals, with trigonometrical heights in figures; and roads and paths are in red. Boundary beacons, trigonometrical stations, and intersected trigonometrical points are clearly shown.

AFRICA.

Egypt. **Survey Department, Cairo.**

Egypt. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets: 1-E, North-West Delta; 1–F, North-East Delta; 2–E, South-West Delta; 2–F, South-East Delta. Size 18 by 23 inches. Cairo: Survey Department, 1914.

These four sheets comprise the whole of the delta from Helwan and Cairo to the Mediterranean, and together form a general map that will doubtless prove very useful

at the present time. The desert region for about 25 miles to the east of the Suez canal is shown and contoured in brown at intervals of 10 metres. The map is printed in colours, and gives canals, drains, railways, boundaries, travellers' routes, wells, ferries, relative importance of towns by different symbols, and other information.

AMERICA.

Alaska. **Alaska Road Commission.**

Map of Alaska. By the Alaska Road Commission, 1913. Scale 1 : 125,000 or 1 inch to 19·7 stat. miles. 4 sheets, each 29 by 35 inches. [Washington, D.C., 1913.]

This map has been compiled from surveys of the Alaska Road Commission, the U.S. Coast and Geodetic Survey, the U.S. Geological Survey, U.S. Army Surveys, and the Canadian Geological Survey. Relief is shown by contours in brown at intervals of approximately 1000 feet; however, too much reliance should not be placed on these, as the information available for drawing them is, in many parts, very scanty. Rivers are in blue, but owing to imperfect registering in printing many of the smaller streams are shown as taking impossible courses with reference to the contour lines. Roads and trails are clearly laid down, as are also railways, and telegraph and telephone lines.

America. **Unstead and Taylor.**

Philips' Comparative Series of Wall Atlases. Edited by J. F. Unstead, M.A., D.SC., and E. G. R. Taylor, B.SC. North America; South America. Scale 1 : 9,000,000 or 1 inch to 142·04 stat. miles. London : George Philip & Son, Ltd., 1914. *Price 27s. 6d. for each set of eight maps. Presented by the Publishers.*

These two sets of maps form part of an excellent educational series now in course of publication, notices of which have from time to time appeared in the *Geographical Journal*. With the exception of the British Isles set, which has special maps, each set consists of eight boldly drawn maps mounted on linen, with rings for hanging in class-room, and arranged so as to fold compactly in a box when not in use. Each map measures 43 by 33 inches, and shows by means of bold symbols and carefully selected contours the special information with which it deals, which is as follows: 1, Relief of land and communications; 2, political divisions; 3, climate, summer conditions; 4, climate, winter conditions; 5, temperature; 6, natural vegetation; 7, economic; 8, density of population. The whole series has been arranged to comprise seven sets, as follows: British Isles, Europe, Asia, Africa, North America, South America, and Australasia; and of these only the last, Australasia, now remains to be published. Each set is accompanied by an explanatory handbook for the assistance of teachers.

British Guiana. **Hohenkerk and Fowler.**

Map of British Guiana. Scale 1 : 633,600 or 1 inch to 10 stat. miles. 2 sheets, each 29 by 35 inches. Published by authority of His Excellency the Governor, Sir Walter Egerton, K.C.M.G. Revised and corrected to date from the records of the Department, by L. S. Hohenkerk, Government surveyor in the Department of Lands and Mines, Georgetown, Demerara, under the direction of Frank Fowler, F.G.S., Commissioner of Lands and Mines, 1913.

A useful general map giving considerable amount of detail from the latest information. Apart from the boundary, which is in red, the map is in black and white only. The hills are shown by vertical hachures, and it would have been an advantage if they could have been printed in brown, as in places where the shading is heavy the names are not easily legible.

Canada. **Dept. of Mines, Ottawa.**

Geological Survey of Canada. Map 118 A, Pleasant river, Barrens Gold District, Lunenburg County, Nova Scotia. Economic Geology. Scale 1 : 6,000 or 10·56 inches to 1 stat. mile. Ottawa : Department of Mines, Geological Survey, 1914. *Presented by the Department of Mines, Geological Survey of Canada.*

Canada. **Dept. of the Interior, Ottawa.**

Map showing Elevators in Manitoba, Saskatchewan, and Alberta. Prepared in the Railway Lands Branch, F. C. C. Lynch, Superintendent. Scale 1 : 1,584,000 or 1 inch to 25 stat. miles. Size 16 by 35 inches. 6th edit. Ottawa : Department of the Interior, Railway Lands Branch, 1914. *Presented by the Department of the Interior, Railway Lands Branch, Ottawa.*

Canada—British Columbia. **Dept. of Lands, B.C.**

New Westminster and Yale. Scale 1 : 253,440 or 1 inch to 4 stat. miles. Size 30 by 40 inches. Victoria, B.C. : Department of Lands, 1914. *Presented by the Surveyor-General of British Columbia.*

ATLANTIC OCEAN.

Madeira. **Power.**

General map of the Island of Madeira, constructed by Charles Power from other maps, greatly improved, corrected, and brought up to date, 1914. Scale 1 : 100,000 or 1 inch to 1·6 stat. miles. Size 12 by 24 inches. London : George Philip & Son, Ltd., 1914. *Price* 1*s.* 6*d.*

This map is published by Messrs. G. Philip & Son, and not by Messrs. E. Stanford, Ltd., as stated in the January number of the *Geographical Journal*.

WORLD.

World. **Bacon.**

Bacon's Sixpenny Contour Atlas. South Scotland Edition. Size 10 by 7½ inches. London : G. W. Bacon & Co., Ltd., [1915]. *Presented by the Publishers.*

CHARTS.

Atlantic, North. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, January, 1915. Washington : U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

Burma. **Hunton, Smith, and Ashton.**

Rangoon river and approaches. Surveyed 1913 and 1914 by A. S. Hunton, F.R.G.S., and V. G. Smith, F.R.G.S., under the direction of H. G. G. Ashton, F.R.G.S., Deputy Conservator of the Port. Scale 1 : 53,390 or 1·19 inch to 1 stat. mile. Rangoon : Commissioners for the Port, 1914. *Presented by the Deputy Conservator of the Port, Rangoon.*

Central America. **U.S. Hydrographic Office.**

Pilot chart of the Central American Waters, January, 1915. Washington : U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

Indian Ocean. **U.S. Hydrographic Office.**

Pilot chart of the Indian Ocean, March, 1915. Washington : U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

Norway. **Norges Geografiske Opmaaling.**

Kystkarter : No. 68, Fra Steigen til Tranöy ; 79, Fra Harstad og Kvæfjord til Risoysund og Senjen ; 217, Romsdalsfjordene ; 227, Fra Beiaren og Saltfjorden til Bodö og Folla. Christiania : Norges Geografiske Opmaaling, 1915. *Presented by the Norwegian Geographical Institute.*

Pacific, North. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific Ocean, March, 1915. Washington : U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

China. **Doodha.**

Seven photographs of south-west China taken by N. B. Doodha. *Presented by N. B. Doodha, Esq.*

These are silver prints measuring 2⅝ by 3¾ inches.

(1) Miao woman ; (2) Miao bride and bridesmaids ; (3) Miao village and children ; (4) Miao band ; (5) Miao boats ; (6) Miao boat ascending a rapid ; (7) Ricefields.

France. **Delbanco.**

Two photographs of the Cirque de Gavarnie, Pyrenees, taken by David Delbanco. *Presented by David Delbanco, Esq.*

Two clear little photographs showing the scenery of this beautiful district. They measure 3 by 4 inches.

Persia. **Sykes.**

Set. 1. Fifty-three photographs taken on a tour from Meshed to the Elburz mountains, 1912. *Set.* 2. Twenty-eight photographs taken on a tour from Meshed

to the Darragaz district. By Lieut.-Col. P. M. Sykes, C.M.G., C.I.E. 1913. *Presented by Lieut.-Col. P. M. Sykes, C.M.G., C.I.E.*

The journeys during which these most important photographs were taken were described by Colonel Sykes in the paper he read before this Society last month. As may be judged from the titles, they are full of geographical and archæological interest, and form a valuable addition to our collection. They are all one size, measuring 4¼ by 6¼ inches. Most of the photographs quite unique, as the districts were to a great extent unexplored before Colonel Sykes's visit.

Set 1. (1) Family of Kurds in the Isfarayin valley; (2) Group on the Kurd-Turkoman frontier; (3) Kurd group; (4) In a Kurdish village; (5) Kurdish musicians; (6) Village of Zard, on the Bujnurd-Gurgan frontier; (7) Near the Gurgan defile; (8) At the village mosque, Semalgan valley; (9) The Yuzbashi or Centurion, near the Gurgan defile; (10) Kurd Shikarries; (11) At the Gurgan defile; (12) The governor of Nardin; (13) Nardin Sowars; (14) In the Pursian valley, between Nardin and Ramian; (15) In the Pursian valley; (16) Geraili Turks in the Pursian valley; (17) Geraili Turks; (18) Kala Maran, possibly ancient Dareion; (19) On the summit of Kala Maran; (20) Looking north from Kala Maran; (21 and 22) In the heart of the Elburz; (23 and 29) Geraili Turks; (24) On the outskirts of Ramian; (25–27) Ramian; (28) Drying barley, Ramian; (30) Funeral of a Sayyid, women's procession; (31) Ricefields in the heart of the Elburz; (32) Refugees from the Turkoman; (33) Gurgan pass, leading from Nardin into the Elburz; (34) Musicians in the Isfarayin valley; (35) Governor of Isfarayin; (36) Indian sowars in the Isfarayin valley; (37) Kurdish types; (38) Cotton crop at Jajarm; (39) Mill near Bann; (40 and 41) Jalayir Turks; (42) A Bactrian camel; (43) Meshed from the east; (44) Meshed from the city wall; (44A) Meshed from the roof of the Consulate-General; (45) A Berberi type; (46) In the Kashaf Rud valley; (47) Gulistan; (48) A typical villager near Meshed; (49) Faz, the birthplace of Firdausi; (50) The supposed site of Firdausi's tomb; (51) The walls of Tus; (52) The Chashma-i-Sabz.

Set 2. (2) The chief of the Ismailis of Khorasan; (3) Indian sowar and natives of Khorasan; (4) On the Meshed-Askabad road, Kurd of Chinaran; (5) The Bahmangan valley, near the sources of the Atrek; (6) Village Elder of Yadak; (7) Village elders of Yadak; (8) Yadak fort; (9) Boys at Yadak; (10) Lower fort at Yadak; (11) Guna Zu leading to Mian Kuh district; (12) Burning rue to avert the evil eye in Mian Kuh; (13–15) Kupkan; (16) View up valley from Kupkan; (17 and 18) The Nardaban or "Ladder" of Nadir; (19) Nomads descending from the Allah ho Akbar range to Darragaz; (20) Nomad women descending the Allah ho Akbar range; (21) Ruins of the "Maulud Khana" or birthplace of Nadir; (22) A Chapashlu Turk; (23) At the base of Yarim Tappa; (24) Yarim Tappa from the south-west; (25) The chief of the Chapashlu-Masud Khan; (26) Stone base found at Yarim Tappa; (27) Stonework found at Yarim Tappa; (28) Site of Shahristana, city in Darragaz valley destroyed by Chengiz Khan; (29) Tomb of Hazrat Sultan, in Darragaz valley.

Pratas island. **Eldridge.**

Five photographs of Pratas island, China sea, taken by E. J. Eldridge. *Presented by E. J. Eldridge, Esq.*

Pratas island is about 200 miles south-east of Hongkong. Although not over-clear specimens, these photographs are interesting as it is not likely that many others of the spot exist. They measure 2 by 3 inches.

(1) View from the south; (2) Scrub that covers eastern end of island; (3) Specimen of large tree; (4) Seabird on its nest; (5) Central mast, 120 feet, with look-out platform.

N.B.—It would greatly add to the value of the collection of Photographs which have been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

THE ADAI KHOKH GI

From the 1 verst to 1 inch Russian Survey

HAROLD RAEBURN

1914.

Published by the Royal Geographical Society

S

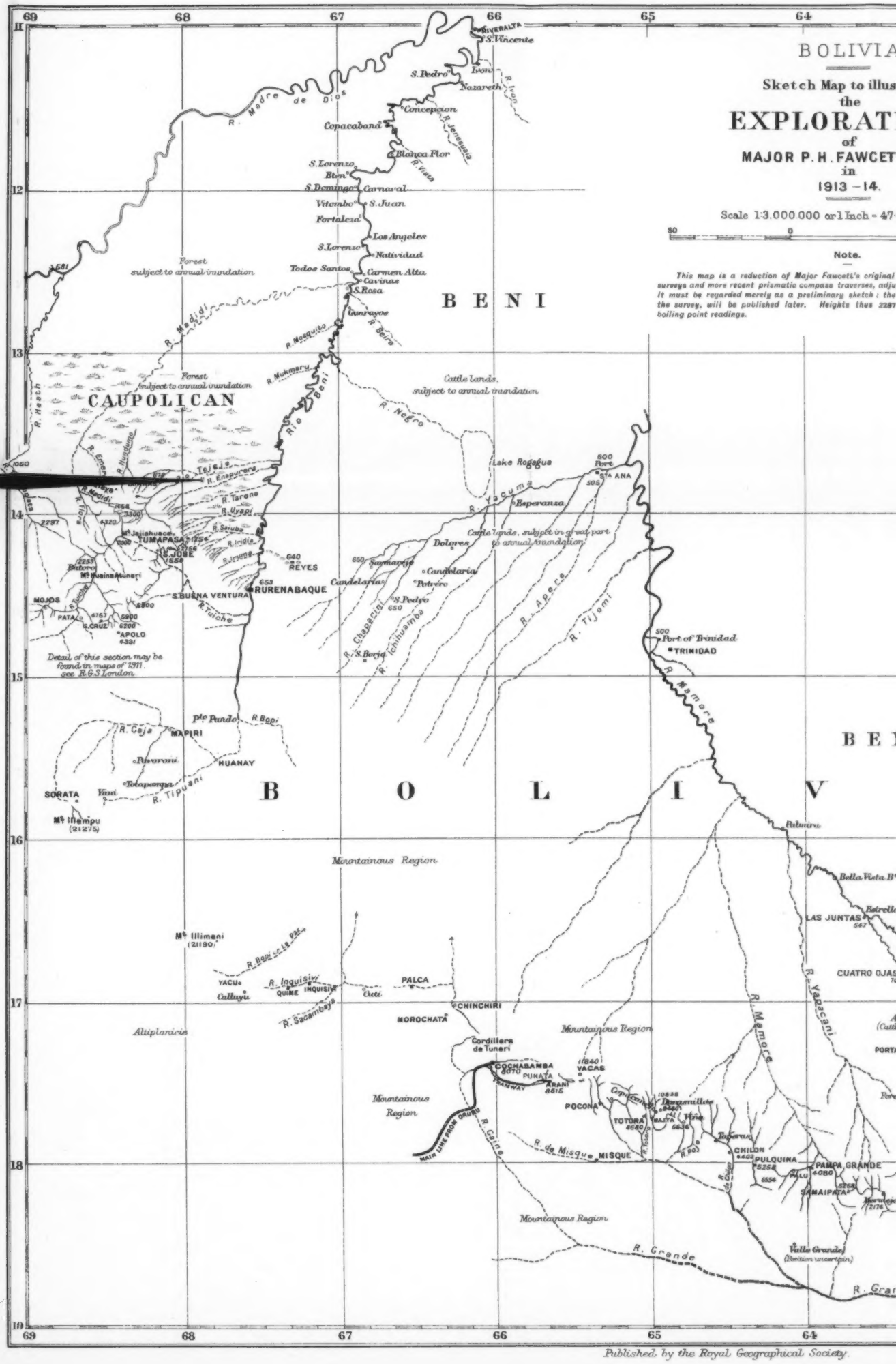
KH GROUP

Surveys, with corrections by

EBURN.

CAUCASUS

RAEBURN


BOLIVIA
Sketch Map to illus
the
EXPLORAT
of
MAJOR P. H. FAWCET
in
1913 – 14.
Scale 1:3.000.000 or 1 Inch = 47
Note.
This map is a reduction of Major Fawcett's original
surveys and more recent prismatic compass traverses, adju
It must be regarded merely as a preliminary sketch: the
the survey, will be published later. Heights thus 2297
boiling point readings.
BENI
CAUPOLICAN
Forest subject to annual inundation
Cattle lands, subject to annual inundation
Lake Rogagua
Esperanza
Dolores
Candelaria
Potrero
S. Pedro
S. Borja
REYES
RURENABAQUE
S. BUENA VENTURA
TUMAPASA
S. JOSE
MOJOS
PATA
S. CRUZ
APOLO
MAPIRI
HUANAY
SORATA
Mt Illampu (21275)
TRINIDAD
Port of Trinidad
Palmira
Mountainous Region
Mt Illimani (21190)
PALCA
CHINCHIRI
MOROCHATA
Altiplanicie
Cordillera de Tunari
COCHABAMBA
PUNATA
VACAS
POCONA
TOTORA
CHILON
PULQUINA
PAMPA GRANDE
SAMAIPATA
MISQUE
Valle Grande
(Position uncertain)
R. Madre de Dios
R. Beni
R. Mamore
R. Yacuma
R. Apere
R. Tijomi
R. Negro
R. Tuichi
R. Caja
R. Tipuani
R. Grande
R. Gra
Published by the Royal Geographical Society.

BOLIVIA
Fawcett.

NOTE.—Many of the names on this map of Spitsbergen have been substituted by Captain Isachsen for those which appear on the Admiralty Charts and other British maps of the group.

NOTE.

Full information concerning the construction of this map will be found in Captain Isachsen's Notes published in the *Geographical Journal* for March, 1915.

Published by the Royal Geographical Society.

SPITSBERGEN.
ISACHSEN.